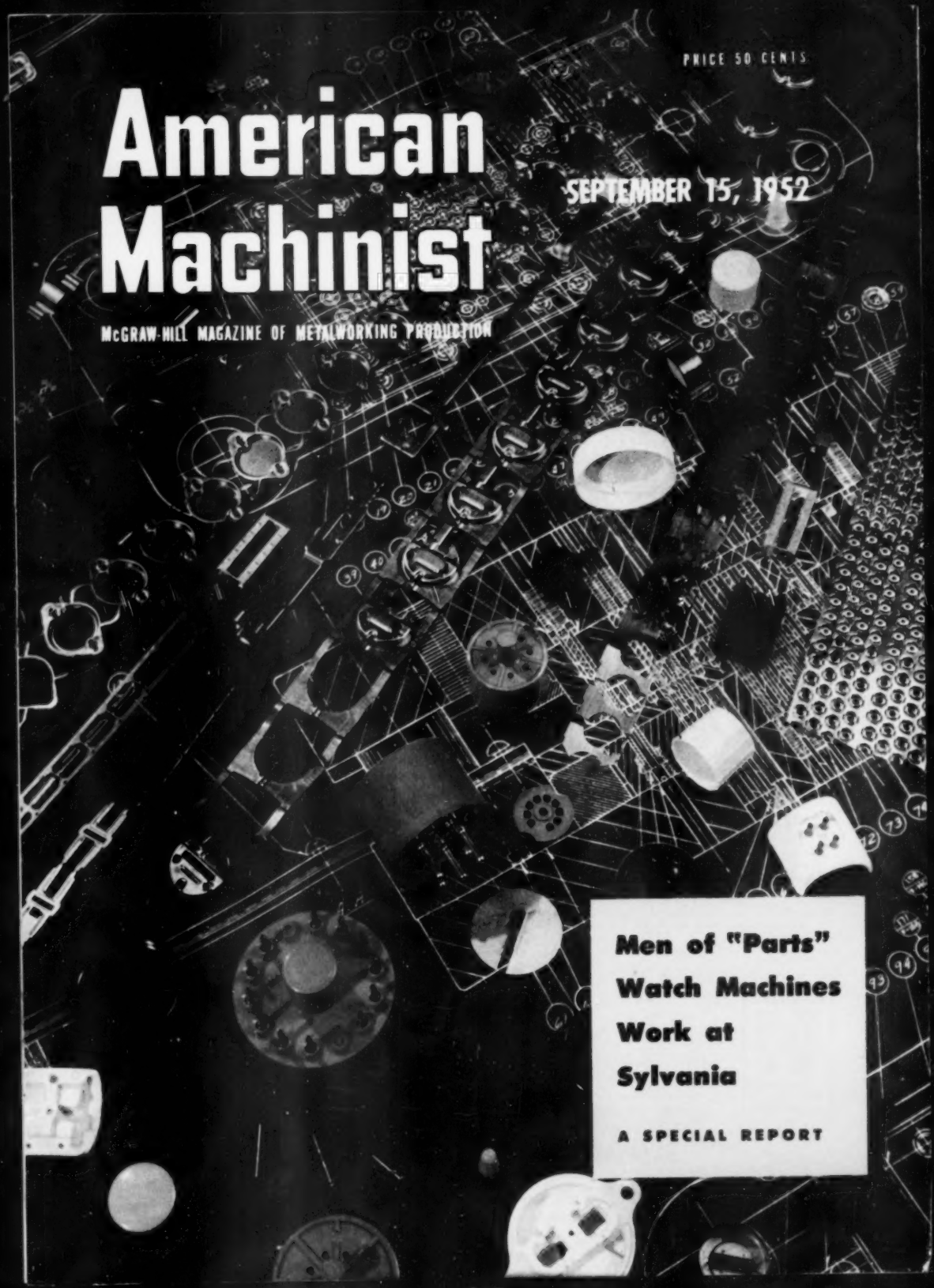
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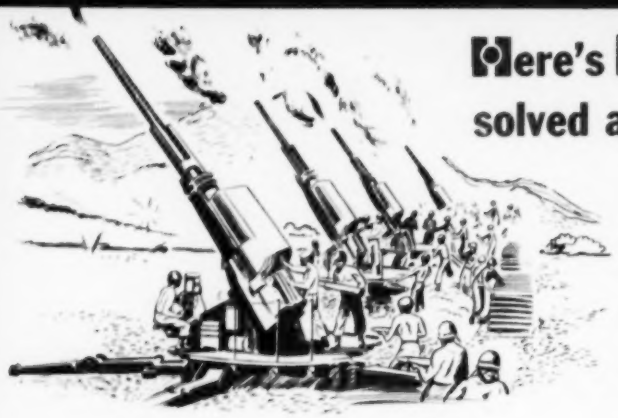
American Machinist
SEPTEMBER 15, 1952
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
Men of "Parts" Watch Machines Work at Sylvania
A SPECIAL REPORT



Here's How Heald precision solved a vital ordnance problem

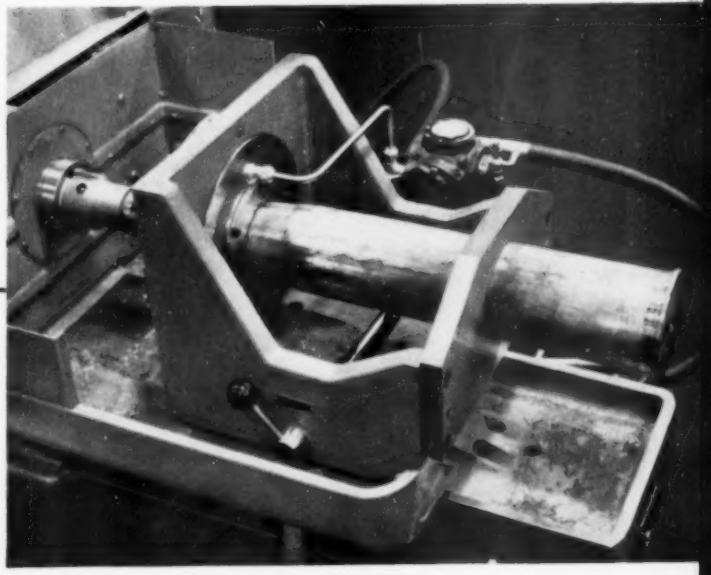
The successful salvage of used artillery shells calls for a high degree of accuracy and precision in the re-boring operation. Speed is important, too—to maintain high rates of production and keep salvage costs to the minimum.

These exacting requirements were easily met with the Heald Model 121 Bore-Matic shown below—arranged for re-borizing 90 mm shell cases. The work is held in a single-station angle-type fixture with a quick-acting air-operated collet chuck. Table is started left at rapid traverse, slows to bore, then reverses at rapid traverse. A retractable boring bar eliminates tool drag line during outstroke. Bar automatically rests to boring position when table reaches rest position.

Remember—when it comes to precision finishing, it pays to come to Heald.

Re-borizing on a Heald Model 121 Bore-Matic makes used 90 mm shells as good as new

Heald Model 121 Bore-Matic, arranged for fast, precision re-boring of 90 mm artillery shell cases.



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Chips and Quips

Our Cover . . . Sylvania Electric Products is a "vertically integrate" company, meaning that it has many plants, most of them small and widely scattered, each operating somewhat independently. One group of plants produces parts for the others and for outside customers, parts of metal and of plastics.

Several months ago, two editors of *American Machinist* went through the plants at Warren and Emporium, Pa., with a photographer, Jim Burns. In a lengthy trip, they selected exceptional operations and got details—the first article from these plants. From a great number of fine progressive dies, we selected the ones that typify advanced practice, and show cross-sections, finished parts and strips. Some are press dies, some multislide. There's also an extensive array of unusual production setups—the whole making a 24-page Special Report.

As for the cover, that shows some typical parts and strips, with a die print behind them. It gives some idea of what the men of "Parts" do—and introduces our story of how they do it.

Contouring . . . We feel that there's much you want to know about contouring. We give you a major piece of it in our Special Report on Contour Turning (*AM*—Dec 10 '51), and have published several articles on the subject. Now we bring you a 2-part series on contour grinding, by Fred Victory, chief engineer of Moore Special Tool. Later on, we'll show you the oldest form of contour turning (but one of the most precise), and then a definitive report on contour milling. Mr Victory's first article covers wheel-dressing equipment and contour-grinding methods.

Machine-Tool Line . . . Lots of people, including Walter Reuther, have talked of conveyor-line assembly of machine tools. Now, one of the older companies in the business has done it—and well. In four pages of pictures, we show how Brown & Sharpe assembles automatic screw machines on a conveyor. Here's a precision product put together like a car or a toaster.

Drawing Cups . . . Rheem Mfg Co is supplying hot-forged cups to Frankford Arsenal for deep-drawn steel cartridge cases for the 75-mm recoilless rifle. The technique eliminates 14 progressive steps, saves tons of spheroidized steel plate, simplifies scrap handling, and cuts tooling cost. George DeGroat tells all about it herewith.

Ultrasonics . . . For a couple of months, we've been sitting on a hot story—to get details just right before publication. It's one of the answers to the problem of shaping carbides, and currently looks like a good one. Don't miss this article . . . We also have a 1-page rebuttal on the earlier yarn about friction sawing with box strap. This one is worth checking too.

Research . . . To an increasing extent, research-lab data are coming out into the shop. Now Dr Max Kronenberg shows how productivity charts can be used by the tool engineer and time-study man to select best feed-speed combinations, for tool life, finish, output, or a compromise. It's taken from his address at MIT in June to the largest group of metal-cutting experts ever assembled. People from Switzerland and France were there, too.

Housekeeping . . . From the West Coast is the story of how Solar Aircraft makes surprise checks on plant housekeeping. A foreman and photographer do the tour and picture poor conditions. The worst department gets a flag depicting a doghouse. . . . There are also some pictures from West Coast shops, showing a new trick or two.

Coming . . . Sept 29 *AM* will have a Special Report for management—on cutting overhead costs. There'll also be articles on cumulative sampling, on tricky tooling at McCulloch Motors, on vibration studies of machine tools, on graphite film applied to stamped parts for lubrication in service. There's also Part II on contour grinding.

SAFETY MAN . . . L A Faulkner, supervisor of industrial-plant service, Liberty Mutual Insurance Company, Boston, was the source of our Sept 1 Special Report, "Don't Overlook Operator Safety in Press-Tool Design." We thought you'd like a picture of him, and to know a bit more about him. He's a past chairman of the Engrg Committee, Power Press Section, National Safety Council; actively participated in development of the ASA Codes on Power Presses, Hot Forging Presses, etc. He's a member of the American Society of Safety Engineers and a lecturer on machine guarding at trade association and engineering-society conferences.

THE ANSWER

FOR BETTER LARGE STRAIGHT BEVEL GEARS

This close-up of the sturdy tool slides on a Gleason No. 24A Straight Bevel Generator shows the answer for improved production of large straight bevel gears. By setting the Coniflex® adjusting dials pictured, any desired length of tooth contact can be obtained. Manufacturers of steel mill and mining machinery, power shovels, and similar heavy-duty equipment are using Coniflex gears, with tooth contact suited for the application, for easier assembly, smoother operation, and longer life.

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of cutter and tool

For complete information write for catalog No. M-1734 Cincinnati No. 2 Cutter and Tool Grinder.

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low-cost maintenance

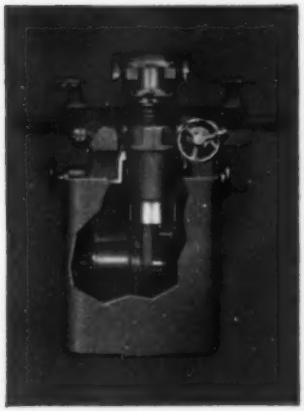
grinding equipment

Grinding wheel spindle cartridge, CINCINNATI **No. 2 Cutter and Tool Grinder, can be replaced in an interval of minutes. Spindle is mounted on anti-friction bearings lubricated for life.**

Anti-friction ways, CINCINNATI **No. 2 Cutter and Tool Grinder, are hardened and ground, easily replaceable.**

A BIG CINCINNATI ADVANTAGE

You probably know all about the versatility of CINCINNATI No. 2 Cutter and Tool Grinders. **But here's something you may not know about—the simplified maintenance features that help many shops out of a tight spot.** Two of these features concern wear. As you know, every mechanism wears more or less in use, but there are only two elements in CINCINNATI No. 2's that may eventually wear and affect performance—anti-friction slideways and wheelhead spindle. Should they need replacement after years of service, **the job can be done by your own men in about two hours' time.** Replacement ways are hardened, ground to "dummy" units in our shop; the wheelhead spindle is completely assembled in a cartridge unit. Anti-friction slideways enclosed motor with plenty of room for maintenance; dual table controls at front and rear; wide selection of attachments for sharpening all types of cutters including sintered carbide . . . these and other features of low-cost cutter sharpening are fully illustrated in a 44-page catalog. You may obtain a copy by writing to our nearest direct office or agent, or the address below.



The motor is enclosed in the base, yet there is ample room for maintenance.

THE CINCINNATI MILLING MACHINE CO.

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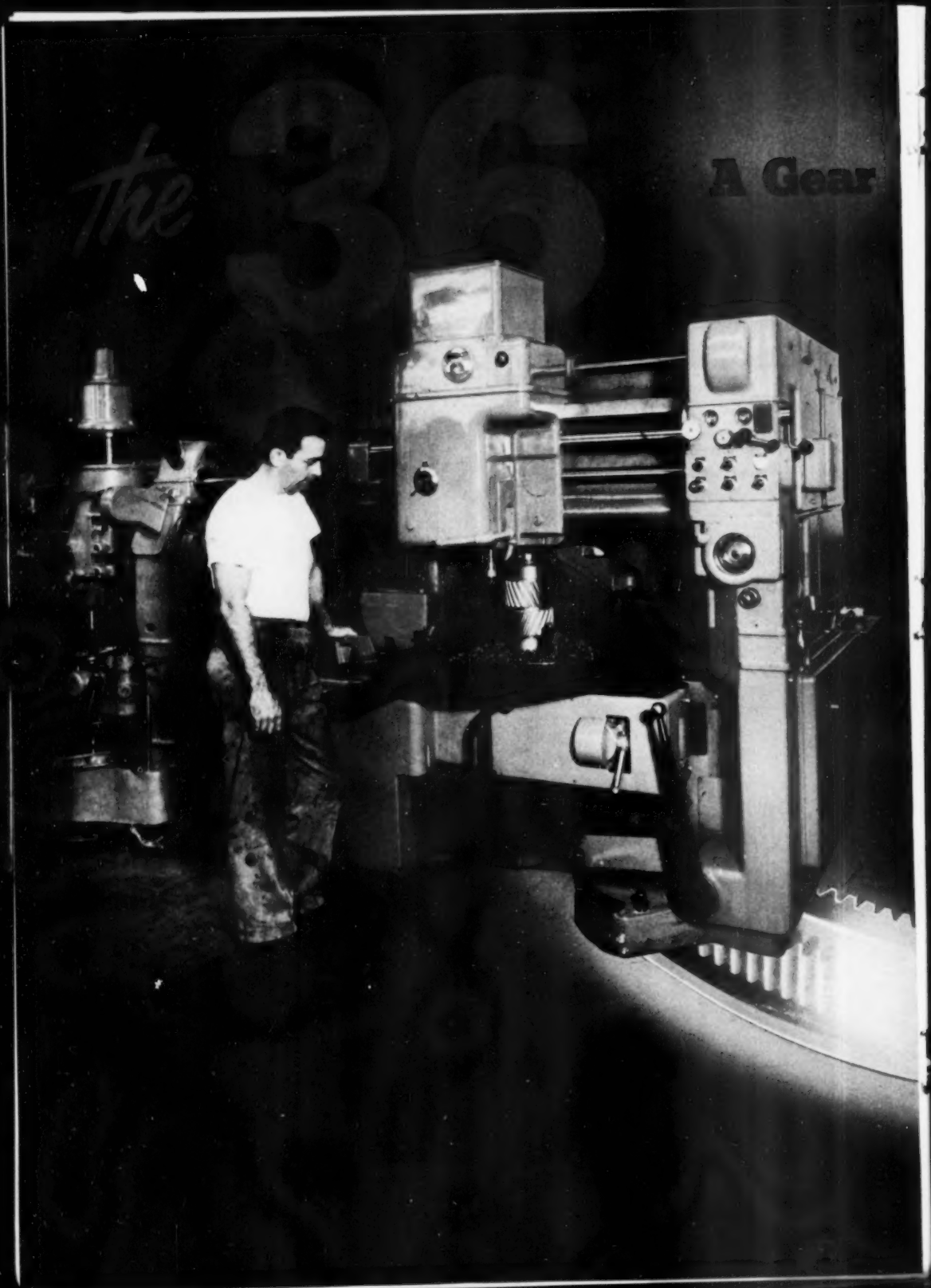
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A Gear

Shaper for HEAVY DUTY SMALLER GEARS

as well as those UP-TO-36" CAPACITY

May we emphasize, once again, that the 36-Type Gear Shaper *cuts small gears fast, too.* More machines are bought for roughing and finishing 8, 10, 12 and 14 inch gears than for the sizes closer to its maximum limit of 36″ pitch diameter.

The secret of the ability of a 36-Type to cut costs—on the run of intermediate size work—as well as big gears—lies in its "beefed-up" design. You can take heavy cuts at high speed, and still hold to precision limits.

Wire, write or phone the Fellows Office nearest you whenever you have need to discuss ways of reducing costs on gear tooth machining operations.

Fellows

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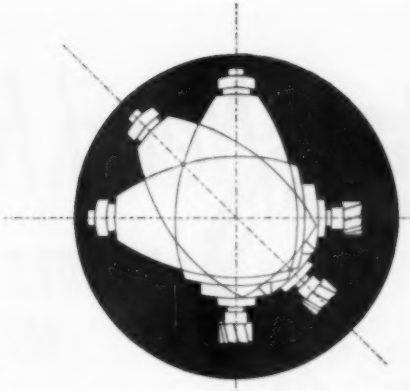
Specifications

No. 22-L

- Table: 45″ x 10″
- Cutterhead in angular position



The Adjustable Cutterhead

BROADENS THE WORK RANGE

of Van Norman Ram-Type Millers

Van Norman Ram-Type Millers mill the original setup at any angle from vertical to horizontal . . . through the full run of the table . . . without adjustments and with fewest re-setups.

Here's how it's done — operator simply swings the adjustable cutterhead from one position to the next, slides the ram in or out if need be, and goes ahead with the next cut. This extreme ease of operation and adjustment . . . applicable over an exceptionally wide range of work . . . reduces total completion time per piece, prevents errors, slashes costs. At the same time, quantity and quality of output is sharply speeded up.

And here are some more important features that cut milling costs — directional control of power-feeds . . . 6-way rapid traverse . . . large, easy-to-read dials . . . wide speed and feed selection . . . rugged construction which assures maximum rigidity.

Van Norman Ram-Type milling machines will do your work faster, more easily and accurately. Six basic models available to meet every job, ranging from toolroom work to production milling. Write for catalogue.

VAN NORMAN COMPANY

SPRINGFIELD, MASSACHUSETTS, U. S. A.

Need Help on

LANDIS ENGINEERS METHODS FOR

1. (Above): A 1½" LANDMACO double spindle machine engineered for threading of V-Belt sheaves is equipped with a 1½" LANCO Head for external threading and a 3ALT tap for internal threading. The complete threading requirements for the work piece are accomplished by one machine and one operator, therefore reducing labor and handling costs.

2. (Right): A special Collapsible Tap used to thread 12" to 18" valve bodies for seat ring insertions. Landis Valve Seat Taps are individually engineered for their particular usage and are supplied to tap valve bodies ranging from the 2" to the 24" size.

4. (Right). A LANCO Taper Cutting Head designed for producing tapered threads up to 2¼" in length and to unusually close tolerances. The die head can be converted to cut a reverse taper by the simple application of a reverse taper cam. Diameters from ½" to 2" and tapers ranging from zero to 2" per foot can be cut with this LANDIS Head.

LANDIS *Machine*

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS

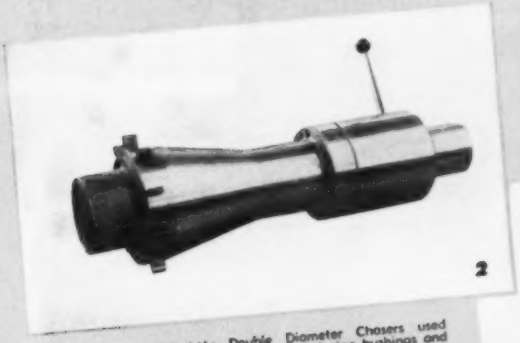
Difficult Threading Jobs?

DEVISE SPECIAL EQUIPMENT AND "HARD-TO-THREAD" WORKPIECES

Don't let the production of an unusual thread hinder an otherwise efficient manufacturing process. Hundreds of companies are today, with *LANDIS* equipment, profitably generating threads formerly considered impossible or too costly for practical operation.

We offer to all manufacturers aid in solving problems in all phases of thread production. We will consult on the original design to insure that the proper thread to best serve a particular function is employed; we will advise as to the best standard equipment to produce a specific thread; we will develop special tooling for the production of an unusual or difficult thread; we will design special holding fixtures for threading workpieces that are difficult to chuck; or we will work out special methods to best fit multiple threading operations into the complete production process.

The illustrations show four examples of such Threading Problems solved by our Engineering Department. No matter what your Threading Problem—let our years of Thread Experience and Engineering Know-How work with you in its solution. Write or call *LANDIS* today.



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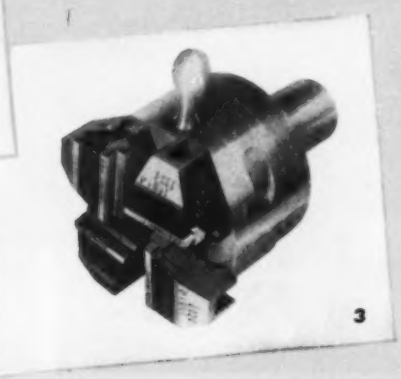


3. (Right): Double Diameter Chasers used to generate threads on reducing bushings and similar work pieces. These chasers cut threads on two different diameters simultaneously; thus, eliminating a second operation. Pitch and thread form for the two diameters must be identical and other limitations necessitate individually designed chasers for threading parts of different dimensions.

4

CO. OF

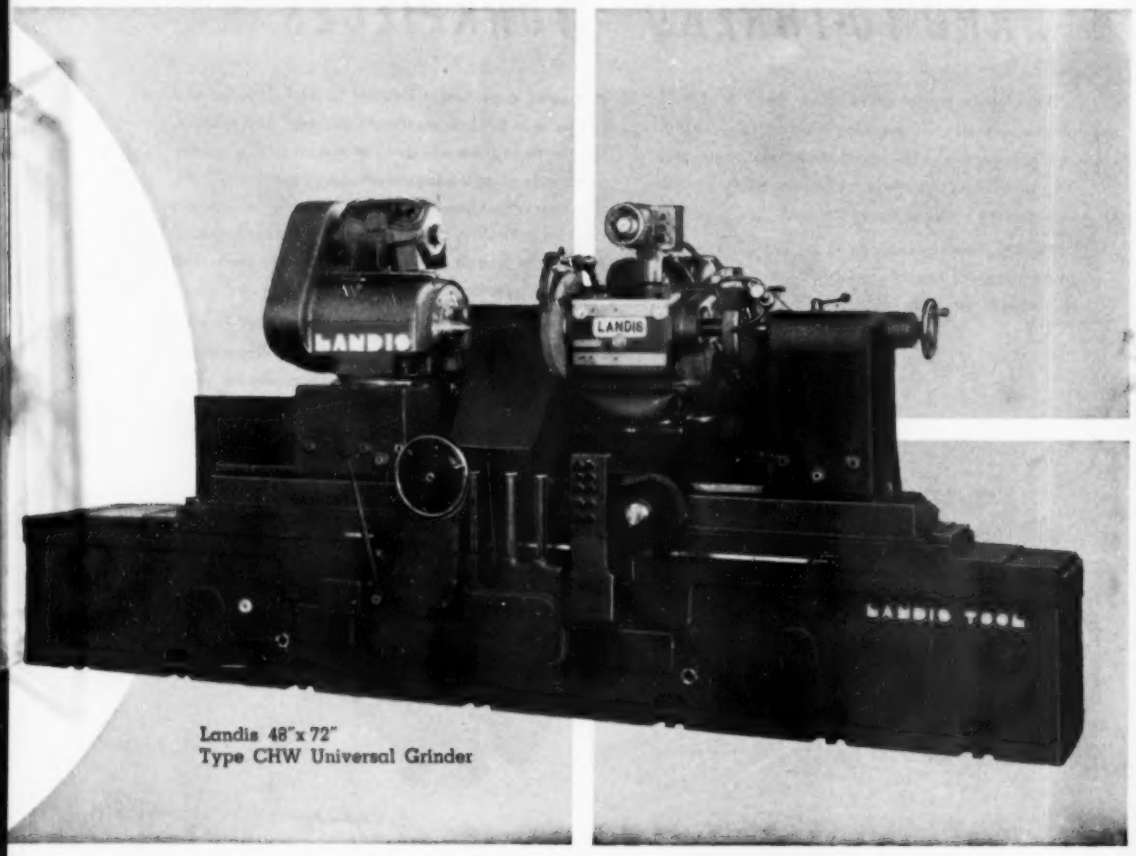
LANDIS TRADE-MARK

WAYNESBORO PENNSYLVANIA

THREAD GENERATING EQUIPMENT

New Landis Development for

Maintenance problems solved with new type CHW Universal Grinders



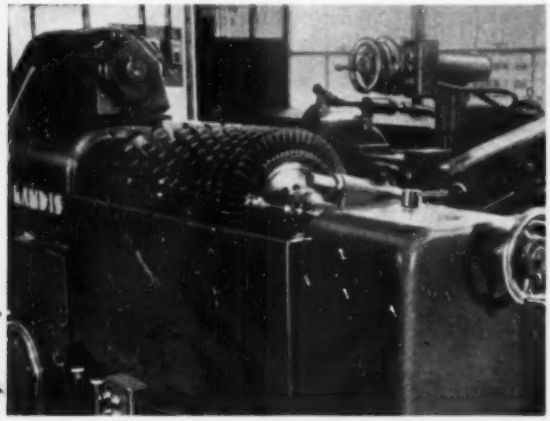
Landis 48"x 72"
Type CHW Universal Grinder

LANDIS
precision grinders

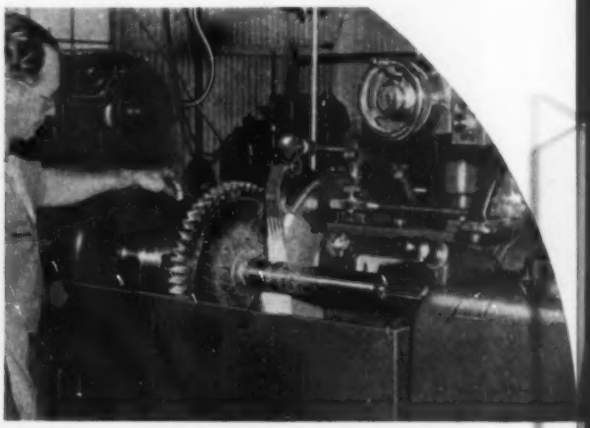
Work swings up to 48" diameter. Length between centers up to 120". If you have a problem grinding large diameter, send us your blueprints for tooling and production estimates.

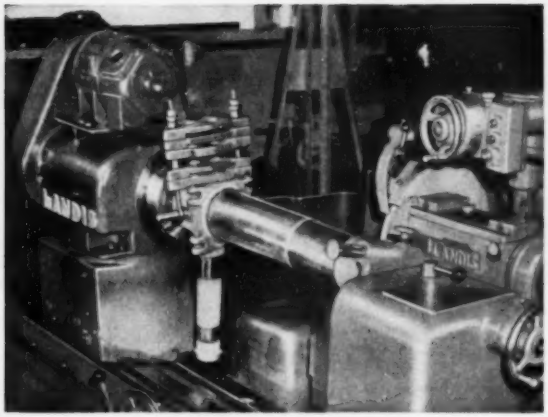
Precision Grinding of Aircraft Parts

COMPRESSOR ROTOR ASSEMBLY
Grinding tips of replacement blades on compressor rotor assembly. Stock removal .075" on diameter. Work held between centers. Extra wide carriage ways provide stability for heavy stock removal and precision limits.

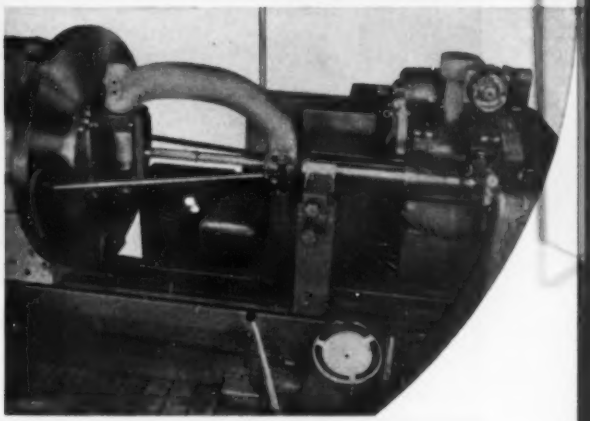


TURBINE WHEEL AND SHAFT
Maintenance grinding of turbine shaft. Stock removal .012" on diameter, grinding chrome carbon steel. Limits are .0005" on diameter. Operator has excellent view of work and wheel.





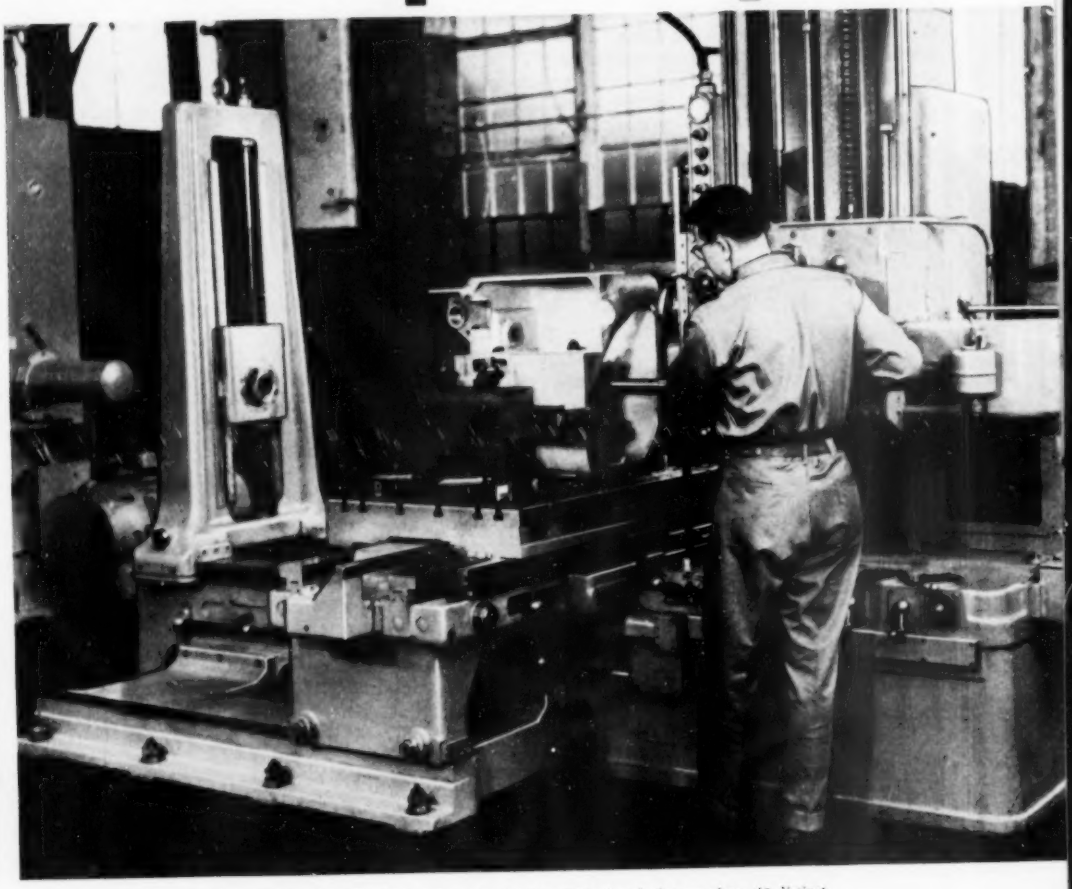
LANDING GEAR INNER CYLINDER
Counter balanced because the weight distribution is unusual. Stock removal is .006" on diameter from chrome plate. Work chucked and driven from live spindle headstock.



LANDING GEAR FORK AND AXLE ASSEMBLY
Recondition grinding operation with special fixture holding and centering work against face plate. Stock removal is .016" on diameter from chrome plate.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Now, 45 Spindle Speeds.

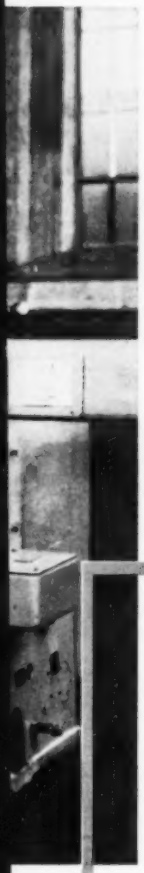


G&L Model C — 300-T equipped with an *automatic electric positioning device* completes 47 distinct operations — including boring, drilling and milling, as well as counterboring and reaming on this complex gear case housing in less than three hours.

GIDDINGS & LEWIS

Table Type Horizontal Boring Machine
Floor-Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hydro Open-Side Planer

from 7 to 1600 rpm . . . The precision plus G&L Model 300-T Horizontal Boring, Drilling and Milling Machines



THE most modern design on the market today — G&L 300-T machines precision bore, drill and mill with EQUAL efficiency. Headstock, table and saddle operate independently — up or down, right or left, forward or reverse — at separate, adjustable feeds.

EXCLUSIVE — 45 reversing spindle speeds. Any speed from 7 to 1600 rpm is easily obtainable by merely adjusting a simple selector lever. This extra wide range of work speeds — plus 23 distinct milling feeds — allows optimum use of modern cutting tools . . . provides exceptionally fine milling or boring operatings.

Available in two models: Model B, with G&L's compact, extra rigid, and "easy-to-work-around" table and saddle . . . and Model C, which has over-the-floor-saddle supports and a larger work table for ultra-precision work.

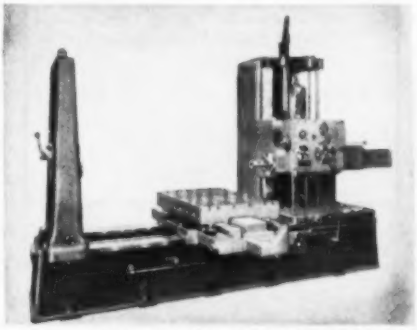
Eliminate Pre-Layout

Both models put precision operations for job lot quantities on a virtual production basis. What's more, Model C is available with an Automatic Electric Positioning Device. This ends the necessity for manual adjustments for table and headstock settings on a wide variety of applications . . . and does it AUTOMATICALLY . . . WITH SETTINGS ACCURATE TO TENTHS OF THOUSANDS OF AN INCH!

Write today for the new G&L catalog on 300-T models. Don't hesitate — DELIVERY MAY BE BETTER THAN YOU THINK!

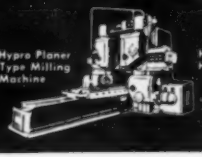
Check these features of Model 300-T

- Easy, accurate setting of .001".
- 3" diameter spindle with speeds from 7 to 1600 rpm. Extra-low spindle speeds are possible because of special 3-to-1 reduction gears.
- 23 distinct milling feeds.
- Extreme rigidity of all components.
- 10 hp, 220/440 volt, 3 phase 60 cycle dynamically balanced AC motor equipped with a electromagnetic brake for positive control at all times.
- Centralized directional controls.
- Automatic electric safety devices.
- Force feed lubrication.
- Noiseless operation.

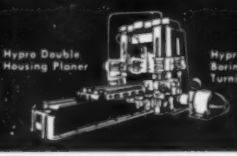


G&L — 300-T Model B Machine.

MACHINE TOOL CO.



Hypro Planer Type Milling Machine

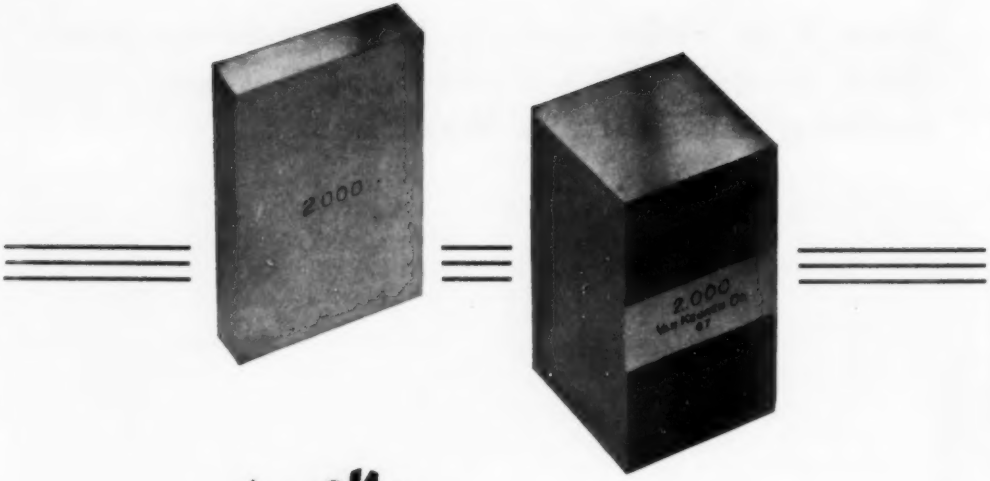


Hypro Double Housing Planer

Hypro Vertical Boring and Turning Mill

G&L TYPE

FOND DU LAC WISCONSIN



Van Keuren GAGE BLOCKS

Conventional Rectangular Gage Block.	SOLID SQUARE MASTER BLOCK.
.360 by 1.375".	1¼" by 1¼".
Area .51 square inches.	Area 1.56 square inches.
For ordinary use.	The 30 Year Blocks.

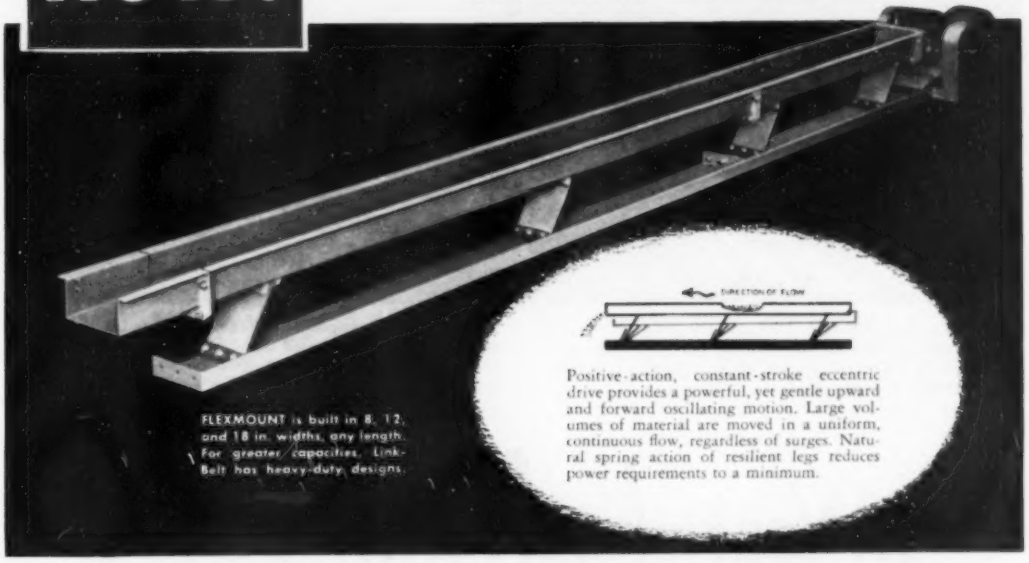
Read about the startling wear tests on Van Keuren Solid Square Master Blocks.

They are unconditionally guaranteed against wear in excess of .0001" for 5 years for any reason whatsoever.

Write for your Van Keuren 1952 Catalog and Handbook No. 35

THE Van Keuren CO.,
33rd YEAR
173 WALTHAM STREET, WATERTOWN, MASS.
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

NOW! FLEXMOUNT Oscillating Conveyors available from stock



FLEXMOUNT is built in 8, 12, and 18 in. widths, any length. For greater capacities, Link-Belt has heavy-duty designs.

Positive-action, constant-stroke eccentric drive provides a powerful, yet gentle upward and forward oscillating motion. Large volumes of material are moved in a uniform, continuous flow, regardless of surges. Natural spring action of resilient legs reduces power requirements to a minimum.

Stock Sections Make Flexmount Positive-Action Oscillating Conveyors—Easy to Order—Easy to Install

HERE'S a big step forward in cutting costs in handling chips, turnings, blasting shot, punchings, stampings. Link-Belt now offers you its new FLEXMOUNT design for immediate delivery from stock.

Stock sections of 8, 12, and 18 in. widths in any length, make ordering easy. Because production-line techniques are used in manufacture, easy-to-install FLEXMOUNT assures low over-all costs.

Leading manufacturers have widely adapted this latest conveying advance — both as integral equipment and as collecting conveyors for carrying material to a central disposal point. They want the uniform, continuous movement of materials . . . the long life offered by FLEXMOUNT. And they like its leakproof trough, compactness and low maintenance costs. It's a simple matter to build up any length desired in your shop from the stock length sections.

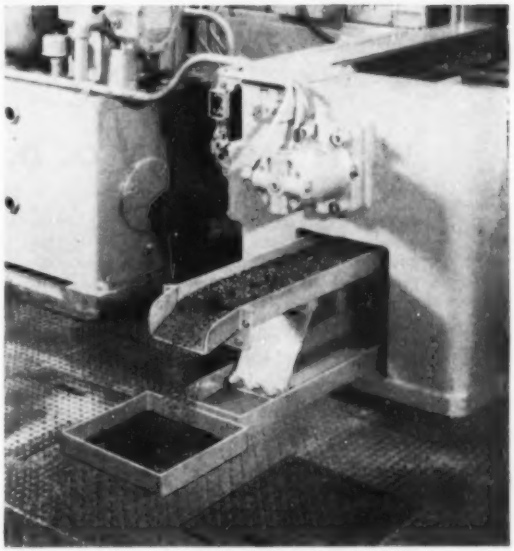
Easy-to-clean FLEXMOUNT Conveyors can be made dust-tight by the simple addition of a metal cover. For complete information, write for new Book 2478.

LINK-BELT

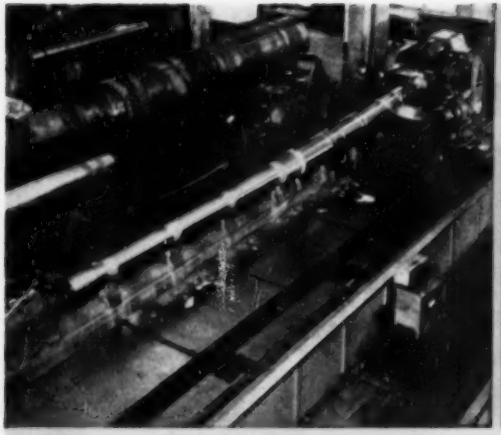
12,400 A

FLEXMOUNT OSCILLATING CONVEYORS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.



FLEXMOUNT Oscillating Conveyor built into an automatic transfer machine. Automotive plant that bought this machine tool also uses FLEXMOUNT for its chip collection system.



Grinding an ordnance part on the world's longest cylindrical grinder. On big jobs like this, where spoilage is so costly, the correct Norton wheels assure you the most consistently accurate results.

A plunge-cut grinding job on a centerless grinder, showing use of a hand-operated sliding work rest. Units being ground are high speed steel drills, for which wheels of Norton ALUNDUM* (fused alumina), in the correct grain size and grade, give best results.

In Your Cylindrical or

It's easier to GET MORE UNITS { per dressing / per hour / per wheel

WITH NORTON O. D. GRINDING WHEELS

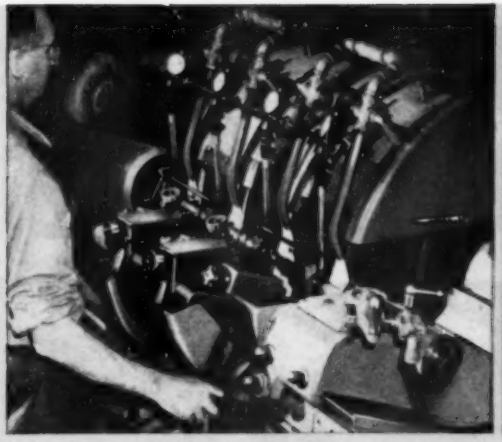
You want your cylindrical or centerless grinding wheels to produce exactly the required tolerances and finish . . . in piece after piece . . . hour after hour . . . with a minimum of dressing or replacement.

With Norton wheels it's *easier* to get these results. Here are the reasons:

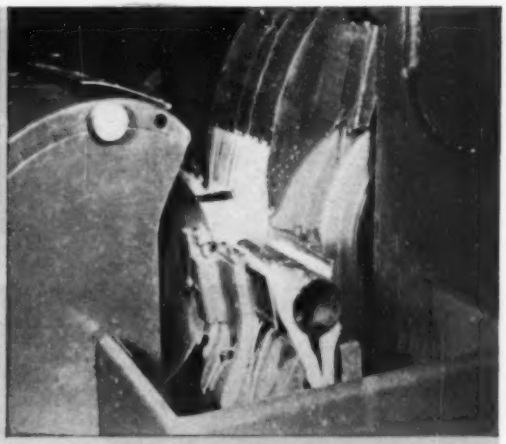
1. Norton Range of Specifications Covers All Your O. D. Jobs. Whatever your material or job specifications — in the *complete* line of Norton wheels for O.D. grinding you're sure to find the *one* wheel with the *right* combination of abrasive grain type and bond for top cutting performance and extra long wheel life — and Norton uniformity assures this top performance in *every* wheel.

2. Norton Applicational Aid Covers Your Grinding Problems. In practically every case your Norton Distributor can quickly tell you which types of wheels you need. Backing him is the Norton Abrasive Engineer in your area. And behind both is the Norton technical staff, representing the resources and know-how of the world's largest manufacturer of abrasives.

3. Norton Stocks Cover Your Delivery Requirements. Your Norton Distributor keeps ample stocks of popular O.D. wheel types and sizes. Larger stocks are maintained in Norton warehouses in key cities throughout the country, and you can always count on prompt shipments from Norton Company's complete stocks in Worcester.

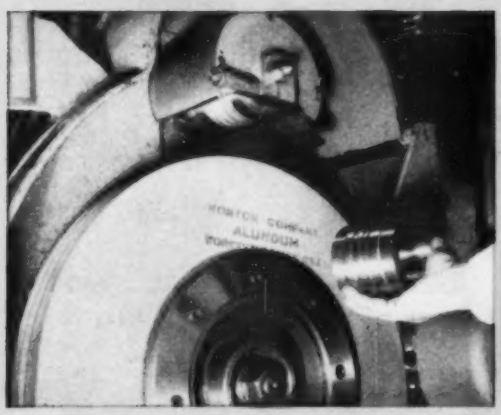


Cylindrical grinding of four diameters at once. Here, close uniformity of wheels is vital — another good reason for choosing Norton grinding wheels with their proved ability to grind multiple diameters to exactly uniform size with a minimum of dressing.



Through-feed grinding of hollow tubing in a centerless machine. Norton wheels are your best bets for peak production and quality in O.D. grinding — on every type of material, from softest aluminum to hardest steel.

Centerless Grinding...



Shaping a wheel by crush truing, with hardened steel crusher roll shown in raised position. Both Norton ALUNDUM* and CRYSTOLON* wheels can be crush trued, to give excellent results in this rapidly growing method of grinding intricate O.D. contours.

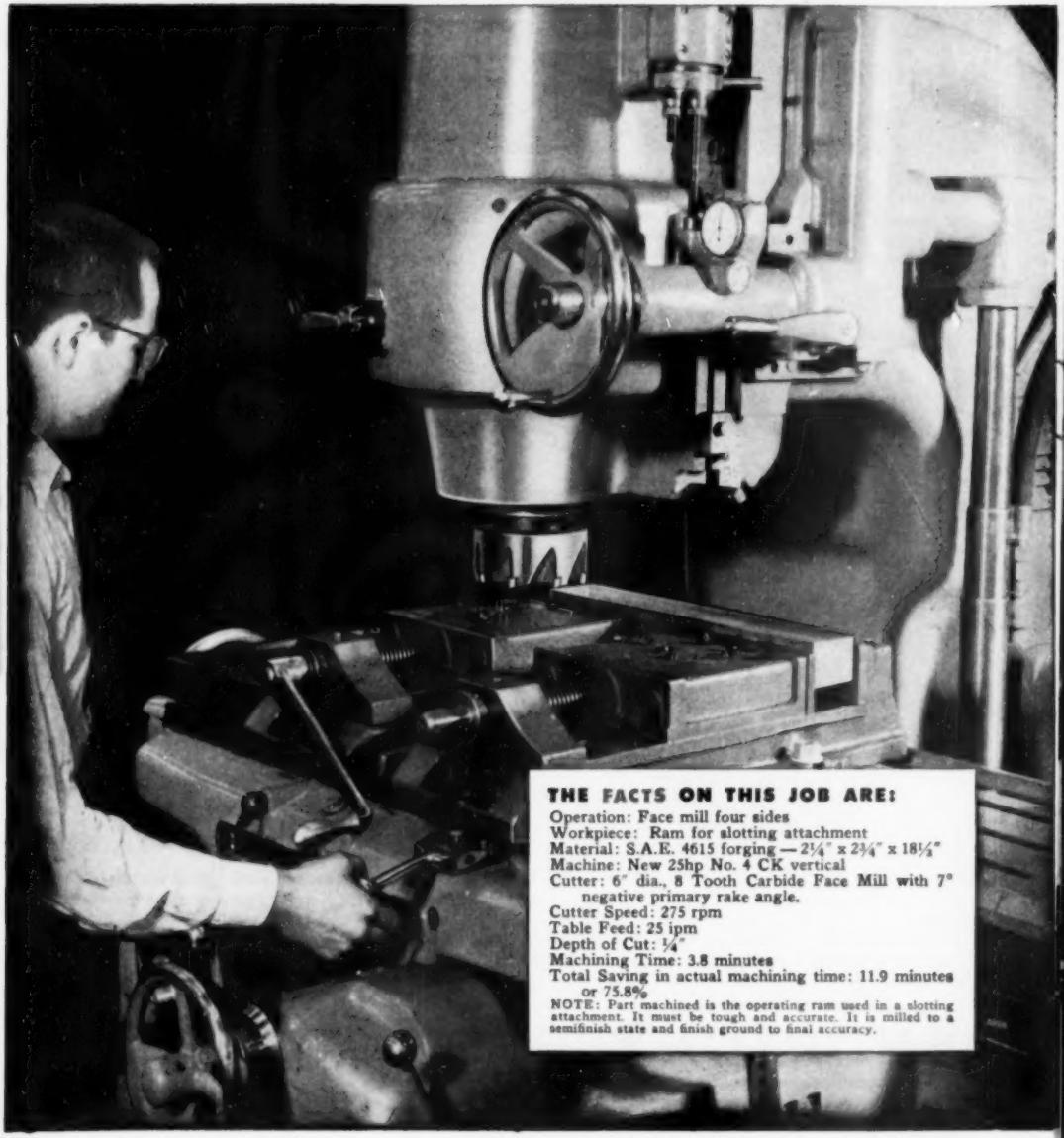
This handy, illustrated booklet gives you the essential facts of cylindrical and centerless grinding, answering many questions and providing convenient selection charts. Ask your Norton Distributor for *The A.B.C. of O.D. Grinding*, or write direct for Form 2006. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products to make other products better

facts tell the story { NEW CUTS



THE FACTS ON THIS JOB ARE:

Operation: Face mill four sides
Workpiece: Ram for slotting attachment
Material: S.A.E. 4615 forging — 2¼" x 2¾" x 18½"
Machine: New 25hp No. 4 CK vertical
Cutter: 6" dia., 8 Tooth Carbide Face Mill with 7° negative primary rake angle.
Cutter Speed: 275 rpm
Table Feed: 25 ipm
Depth of Cut: ¼"
Machining Time: 3.8 minutes
Total Saving in actual machining time: 11.9 minutes or 75.8%

NOTE: Part machined is the operating ram used in a slotting attachment. It must be tough and accurate. It is milled to a semifinish state and finish ground to final accuracy.

KEARNEY & TRECKER MILWAUKEE

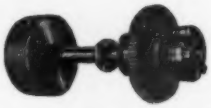
CK MILLING MACHINE PRODUCTION TIME 75%

4615 ALLOY STEEL FORGING MILLED IN 3.8 MINUTES . . . FORMER TIME 15.7 MINUTES

C-K MILLING MACHINE FEATURES THAT HELP DO THIS JOB BETTER

Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.

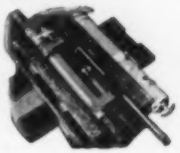
New CK machines have Greater Horsepower. On this job, 25hp permitted operator to get maximum production from his modern cutter.



CK's 3-bearing spindle and flywheel assured Maximum Cutter Efficiency. On this job, it meant fast metal removal and excellent finish in a single pass.

The new Kearney & Trecker CK milling machine on this job has 24 different spindle speeds (13 to 1300 rpm). Its 32 different table feeds range from ⅛" to 90" per minute. Operator was able to pick proper *speed and feed* — to take full advantage of high horsepower and modern tools. The result — Greater Productivity on this job.

CK's new heavy duty (2" dia.) table feed screw gives greater bearing contact for smoother feed performance and sustained accuracy.



New 25hp No. 4 Model CK vertical

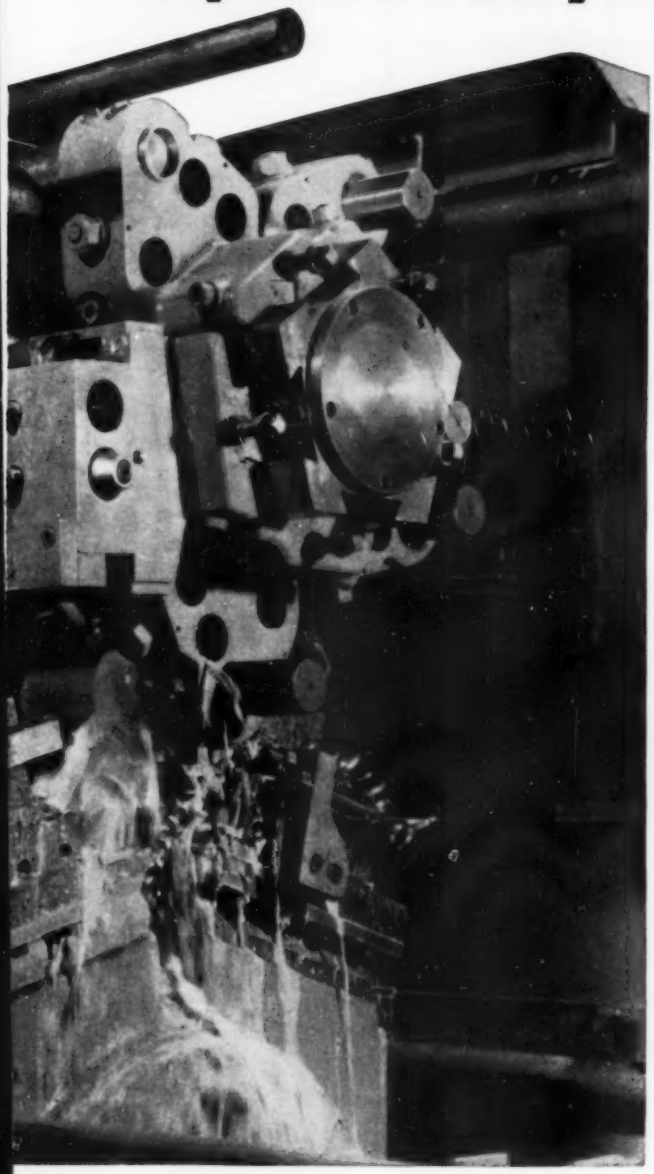
It will pay you to see the new CK line of milling machines — check them against your own requirements. You'll notice how every feature is designed and job-proven to give you cost-cutting results—greater machine capacity, productivity and better finished products. So, for the full story, contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

An especially

Warner & Swasey 1-AC Automatic Chucking Machine used at THE COOPER ALLOY FOUNDRY CO., *Stainless Engineering & Machine Works Division, Hillside, New Jersey.*

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER

important story today....



PRODUCTION UP 220% —YET WITH FEWER OPERATORS!

● Take a look at the record of Warner & Swasey 1-AC Single Spindle Automatic Chucking Machines, used at The Cooper Alloy Foundry Co., to machine Cast Type 316 Chromium-nickel stainless steel Valve Nuts. These automatic machines increased production 220%, reduced floor-to-floor time 69%, turned out more uniform parts, substantially cut costs per part. Yet they required no additional setup time.

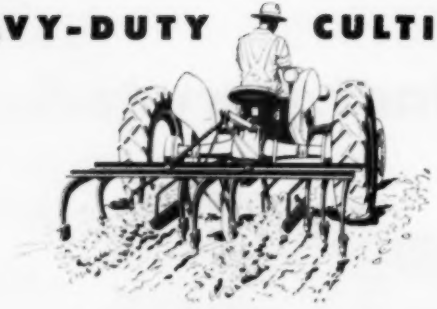
In today's tight manpower market the 1-AC Automatic is taking on increasing importance to management. One man can handle two machines—with each machine turning out substantially more production than an individually-manned, hand-operated machine.

Certain types of machining jobs in your plant can undoubtedly be done better, faster, more profitably—and with less manpower—with the 1-AC Automatic. To find out just how the 1-AC fits into your production setup, call in your nearest Warner & Swasey Field Representative, or write The Warner & Swasey Company, 5701 Carnegie Ave., Cleveland 3, Ohio.

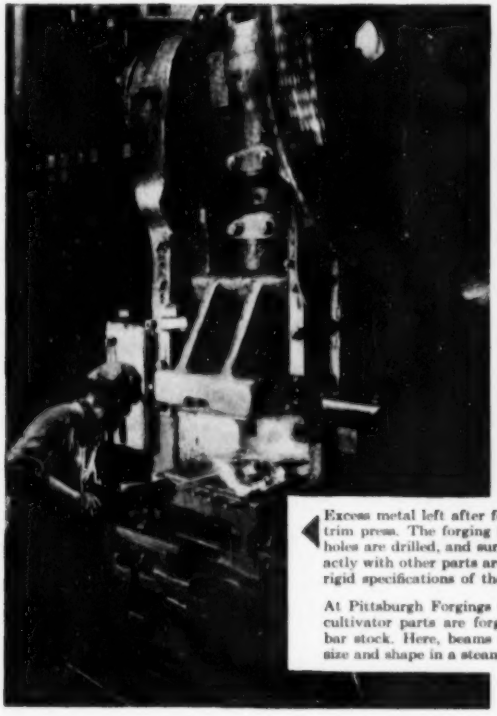
WARNER & SWASEY *Cleveland*

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

IN THIS HEAVY-DUTY CULTIVATOR

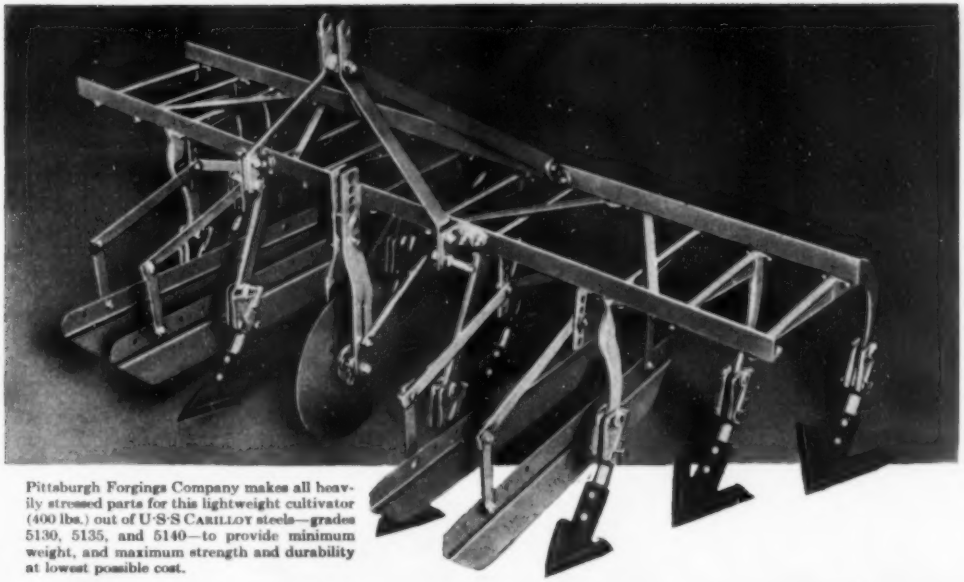


U·S·S CARILLOY steel effectively saves weight, increases durability,



Excess metal left after forging is removed in this trim press. The forging then is straightened, bolt holes are drilled, and surfaces that must align exactly with other parts are accurately milled to the rigid specifications of these cultivators.

At Pittsburgh Forgings Company precision-made cultivator parts are forged from CARILLOY steel bar stock. Here, beams are being forged to final size and shape in a steam hammer.



Pittsburgh Forgings Company makes all heavily stressed parts for this lightweight cultivator (400 lbs.) out of U·S·S CARILLOY steels—grades 5130, 5135, and 5140—to provide minimum weight, and maximum strength and durability at lowest possible cost.

and keeps costs down

TO pack the maximum strength into this heavy-duty lift-type cultivator and to keep its weight as low as possible, Pittsburgh Forgings Company of Coraopolis, Pa., has used U·S·S CARILLOY alloy steel in the shanks, beams, and main frame.

The excellent performance this equipment has been delivering is proof that many parts that must operate in extremely tough service can be made of alloy steels that do not contain critical elements. The three grades of U·S·S CARILLOY used here—CARILLOY 5130, 5135, and 5140—were selected by Pittsburgh Forgings Company years ago for the express purpose of providing minimum weight, maximum strength and durability at the lowest possible cost.

Strong and tough to permit speeds up to 6 miles per hour through heavy soil, CARILLOY steel construction has made it possible to reduce cultivator weight to only 400 lbs. This is about half that of comparable units made of ordinary carbon steel—well below the limit which the tractor lifting mechanism is designed to carry, light enough to be easily shifted on the ground by one man.

U·S·S CARILLOY alloy steel does more in this equipment than provide increased strength, greater durability, and added resistance to wear. It enables the manufacturer to safely decrease the size and weight of all heavily stressed parts, with the result that less steel is required and his costs can be kept well in line with competition.

Our metallurgists have had wide experience with similar applications in alloy steels and have developed special heat-treating procedures that make it possible to obtain maximum mechanical properties from them. We will be glad to assist you in selecting the steel and heat treating methods best suited to your product, and we believe we can help you. Just call the nearest District Sales Office, or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

U·S·S Carilloy Steels

USS

UNITED STATES STEEL COMPANY, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

D-1409

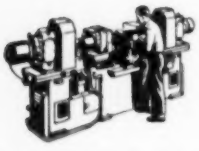
UNITED STATES STEEL

LINK-BELT ball and

...keep company with

Link-Belt Bearing Pillow Blocks are used on this New Holland one-man, automatic, wire-tying hay baler. Other components supplied by Link-Belt: three types of drive and conveyor chain and the screw conveyor that feeds the baling chamber.

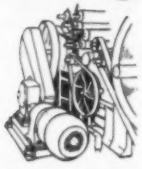
LINK-BELT ball and roller bearings



Metal Working Machinery

Farm Machinery

Construction Equipment



Textile Machines

roller bearings

America's hardest-working machines

ONE BIG reason precision-built Link-Belt Ball and Roller Bearings give you longer bearing life and extended lubricating schedules is the Sealed-Housing feature.

This means that all moving surfaces are completely enclosed and effectively lubricated from a large common reservoir. Only from Link-Belt do you get this important advantage on ball as well as roller bearings. This is only one of the reasons why so many of America's foremost machine designers choose Link-Belt.

There's a Link-Belt bearing for almost every industrial service. Let a Link-Belt bearing engineer help you apply the right types for your needs. You can also get complete engineering information in Data Book 2550.

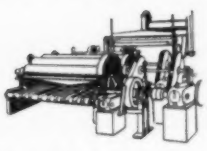
Spring-locking collar with set screws clamps bearing firmly on shaft.
Self-aligning seals effectively keep grease in and dirt out, regardless of alignment.
Wide inner ring distributes bearing load over large shaft area.
Universally aligning. Capacity for radial thrust loads.
Cutaway of Series 200 Ball Bearing Pillow Block — one of many types in the Link-Belt line of Pillow Blocks, Flanged, Flanged Cartridge, Cartridge, Hanger, Take-up Blocks and Unmounted Bearings.
Lubrication fitting with pressure relief feature prevents excessive grease pressure.
Lubricant passes freely into large reservoir to lubricate moving surfaces.
Easily installed by slipping bearing onto shaft and clamping inner ring by tightening two set screws in locking collar.
Sturdy, compact cast housing requires minimum support space.
Slotted bolt holes facilitate mounting on supporting structure.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities. 12,644

LINK-BELT

BALL and ROLLER BEARINGS

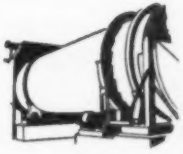
smooth the path of power for all industry



Pulp & Paper Machinery

Materials Handling Equipment

Oil Field Equipment



Processing Equipment

Added Evidence that——

Everyone Can Count on VEEDER-ROOT

This Veeder-Root Reset Magnetic Counter, specially designed for flush mounting on panels and in instrument-clusters, can be connected in series to any device that has a contact arrangement. And it can be located at central *Count*rol-points, at a distance from the machine or process on which performance-figures are needed. Write for full facts.

VEEDER-ROOT INCORPORATED

"The Name That Counts"

HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"Counts Everything on Earth"

On top of his job!

This operator is doing a splendid job at Canadair Limited, Montreal, on the production of F-86E Sabre Jets for the RCAF and, as the illustration shows, he is right on top of his job, too.

He is proud of his fine new 6' 17" column "AMERICAN" Hole Wizard Radial. "It's powerful; it's sturdy; it's easy to operate, and I'm not worn out at the end of the day". What more could any operator ask? As a consequence he turns out a lot of fine work which makes his machine a paying investment for the company.

This *"American"* Hole Wizard Radial has a right angle base, on one wing of which is mounted a Bullard Man-Au-Trol Spacer—as shown by the illustration.

"AMERICAN" Hole Wizard Radials are playing a prominent part in the production of critical defense items for both the U. S. A. and Canada.

For a complete revelation of their virtues send for descriptive bulletin No. 317.

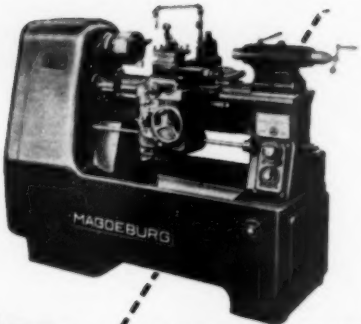
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

AVAILABLE FROM STOCK

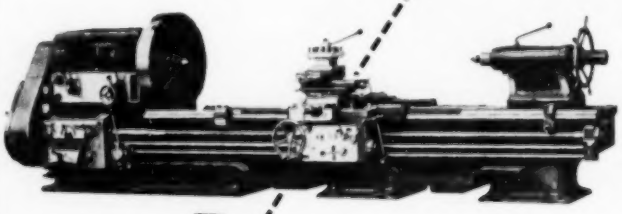
Delivery helped sell these tools... now Industry's sold on their performance

Production-minded plants want more than just delivery on machine tools – foreign or domestic. They want performance and reliable servicing–and they're getting both – reordering these German precision-built tools. Write for complete details.

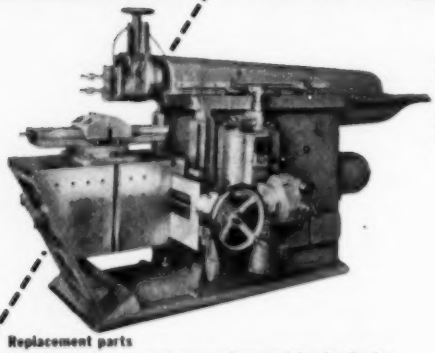


Simplified lathe for fine finishing and high-production–MAGDEBURG PRECISION LATHE with V-belt drive provides accuracy of precision boring machines... does work of fine finishing lathes in around-the-clock production. Operation is simple: one lever controls forward and reverse rotation, speeds and spindle brake. Steel with tensile strength of 110,000 psi can be cut to a depth of 0.158" with a feed of 0.004". Includes contour attachment.

Quick changeover from job-to-job on short or long run heavy-duty drilling production is assured by easily adjustable head and table on new ALFING DRILL PRESS. Crank *raises* or *lowers* table; headstock moves 6" up or down by hand on scraped ways. Easy-to-reach controls cut handling time, too. 9" spindle stroke, driven by either V-belt or flange-mounted AC motor. Motor speed 900 rpm. Drilling capacity of 1" in steel; $1\frac{1}{8}$" in cast iron. 8 spindle speeds from 150 to 1640 rpm. Drilling feed by hand or power. Table surface 26" x 28", Distance between spindle and table, 23" max.; spindle and base plate, 25"-40".



Extra Heavy-Duty Lathes...Precision-built to American standards by internationally known VDF Works. Two models with $30\frac{1}{4}$" and $48\frac{1}{4}$" swing; turning lengths, 20' and 22' 11"; maximum weight of work 6 tons and 10 tons. 30 H.P. and 50 H.P. A.C. base motors. 36 spindle speeds. Scales have inch graduation.



Low-cost, High-Production Shapers...they amazed–and sold–ASTE Show visitors who saw the KLOPP'S unusual speed and capacity for removing metal. Now cutting costs in 15 U.S. plants. Awkward-to-handle, bulky workpieces are easily accessible and simple to set up–because the head travels to the work. Stroke lengths, Mechanical $16\frac{3}{4}$", $20\frac{2}{3}$", $26\frac{5}{8}$"; Hydraulic 26", $33\frac{1}{2}$", $39\frac{1}{2}$".

Replacement parts for all machines in stock at our Cleveland Service Center

Send for current stock list

Lathes	Grinders
Milling Machines	Drill Pointers
Jig Borers	Power Hack Saws
Thread Grinders	Screw Machines
Drill Presses	Balancing Machines
Shapers	Broaching Machines

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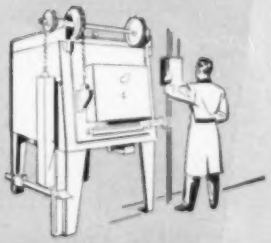
for toolroom or high production... quality HEAT-TREATING calls for a WESTINGHOUSE FURNACE...



Typical Westinghouse Box Furnace used in toolroom heat-treating for hardening. Other Westinghouse Furnaces available for carburizing, drawing, ageing, annealing, austempering, brazing, carbonitriding, martempering, nitriding, preheating, sintering, solution treatment.

There's a Westinghouse furnace to provide the exact answer for every heat-treating application . . . gas or electric. For toolroom or for low-to-medium production applications, choose from over fifteen standard types of box furnaces, ten protective atmospheres. J-10373

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YOU CAN BE SURE... IF IT'S Westinghouse

HEAT-TREATING FURNACES

Westinghouse Electric Corporation,
Industrial Heating Department
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Please send me free booklet, "Westinghouse Furnaces for the Toolroom, Laboratory or Production Line"

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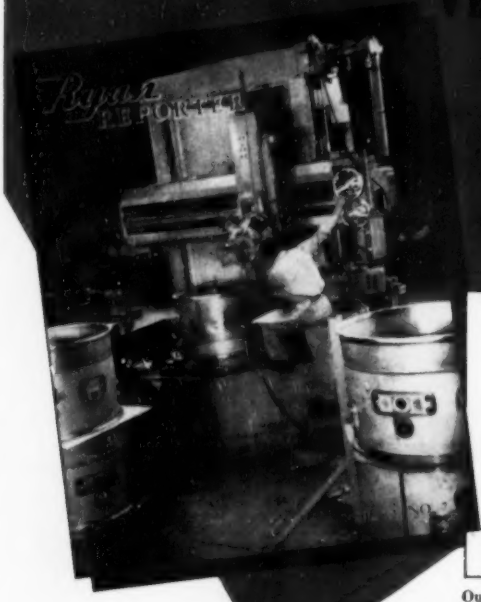
Ryan's



VOL. 12 NOV. 1, 1951 No. 7

Published By
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Lindbergh Field
San Diego 12, California

Frances L. Kohl, art and production editor
William P. Brotherton, technical editor
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D-17 flanges are precision turned on vertical turret lathe. This exhaust cone converts G-E J-47 turbojet into afterburner version with added kick.

ON THE COVER

Our Sincere Thanks to those who have recognized our efforts to Produce a Machine Tool for Manufacturing to the Highest Standards.

In Bullard Machin[illegible]orporated the Engineering Exper[illegible]ce of the past and the knowledge of present requirements. This, naturally, results in Engineering Design for the Utmost in manufacturing Accuracy, Production and Economy of Operation.

Ryan Aeronautical Company in using illustrations of machinery in their plant signify the pride and faith they place in their selection of outstanding manufacturing equipment.

Bullard Engineering Service is available to assist YOU with manufacturing problems. Call on this Service and Know more about the Bullard Line of Machine Tools as applied to your work.

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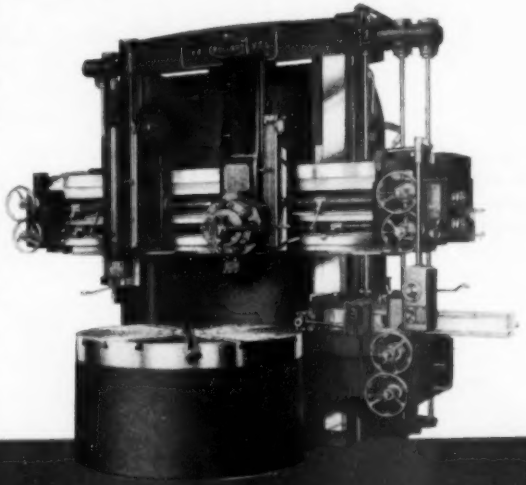

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"We would pay a premium for these 50,000 Air Shipments yet we actually saved thousands of dollars!"

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"When we ship TV film, we're interested in *service*. We can't afford to take any other attitude. We've bought program time all over the country, and those programs *must* be filled.

"We at Dumont use Air Express. It's the fastest. It has all-point coverage. Above all, it is DEPENDABLE.

"As to cost—Air Express costs Dumont *less* than other air services would, by thousands of dollars per year! For instance, on our regular shipments to Detroit, other services cost 37% to 337% *more* than Air Express. And we can't duplicate the service at any price!

"The Air Express people have carried upwards of 50,000 shipments for Dumont in the last four years. Their ability to trace shipments—especially when being shuttled between stations—is almost uncanny! It has helped us out in many an emergency.

"It pays to specify Air Express—in more ways than one!"

AIR EXPRESS

GETS THERE FIRST

Division of Railway Express Agency
1952—our 25th year of service

Hydroforming

CINCINNATI 26" HYDROFORM

Five Hydroform models, capable of forming blanks 12", 19", 23", 26" and 32" in diameter are available. Information on machines of larger capacity furnished on request.

Hydroform

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO

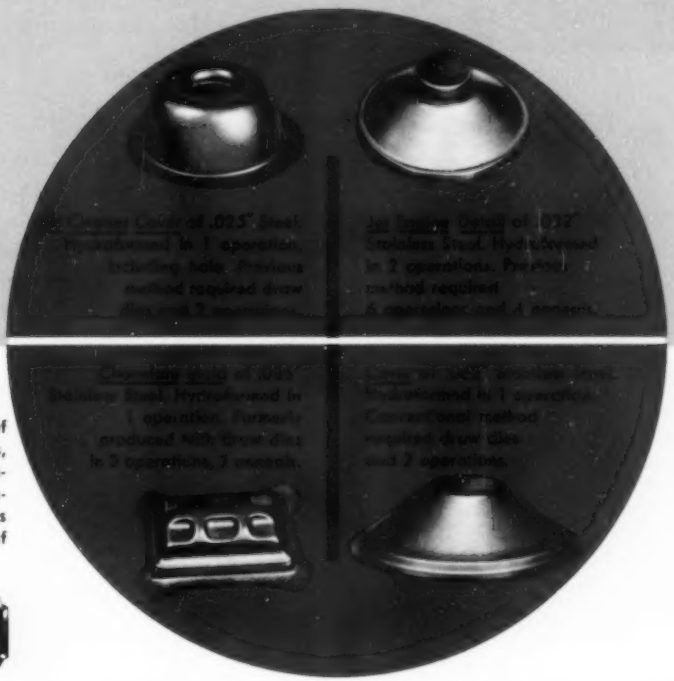
produces deep drawn parts in fewer operations!

One "hug" of the Cincinnati Hydroform produced the finished shape shown in the photo at left. The part, drawn to a depth of 8½" from a 25" dia. blank of .062" aluminum, formerly required five operations to produce.

Hydroforming makes possible the deep drawing of intricate shapes in far fewer operations than conventional practices allow. Many examples are on record where two, three—often more—operations have been saved. Most parts can be Hydroformed in a single draw. But where the shape of the part requires more than one operation, two or more blanks can be stacked and preformed in one stroke. The Hydroform can be tooled to trim, pierce and form light gauge metals in the same operation.

The savings of operations by Hydroforming is but *one* major advantage. The simple tooling required reduces tool costs up to 90%. Practically any shape, from a wide variety of materials up to ⅜" thickness, can be Hydroformed. Part quality is materially improved. Springback, thin-out and spot stresses are greatly reduced or eliminated. Surface finish of the material is unimpaired.

Investigate Hydroforming now. It will change your thinking on deep drawing and forming. Consult your nearest Cincinnati Milling Machine Co. representative for detailed information on this revolutionary metal forming process.

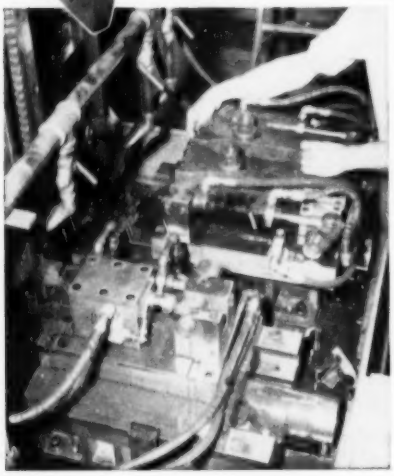


WRITE FOR NEW HYDROFORM BULLETIN

For a complete description of Hydroforming—tooling details, operation, examples of Hydroformed parts, machine dimensions, and general specifications —write for your free copy of Bulletin M-1759.

CINCINNATI

2 separate broaching operations on 1 machine speeds production of tank track parts



the *American* way broached these two sides and these two radii on this tank track part, at the rate of *one part every ten seconds*. The machine used was an American SBD 48-15 Dual Ram Broaching Machine equipped with two American-engineered fixtures, featuring automatic hydraulic clamping, and mounted on two standard receding tables which operate alternately. The left hand table holds two parts for straddle broaching the sides. The right hand table holds two parts for broaching the two radii on each part. A continuous automatic cycle permits the operator to simply load and unload the parts at one fixture while the other fixture broaches.

FULL ROUND BROACHES ADD TO ECONOMY

Full round broaches are used to broach the half rounds. They are simply rotated 180° when dull thus increasing the number of parts produced between resharpenings.

This is a typical example of the complete service you get from American Broach . . . the organization that gives you the extra advantage of experience gained in producing all three . . . broaches, machines and fixtures. For the answer to your problems just send a part-print and hourly requirements. No obligation. Address Dept. A.

For more information on the American SBD 48-15 write for Circular #300.

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STANDARD EQUIPMENT in
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Style "S" Master Collets and Pads

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LOW-COST PRECISION PRODUCTION

- Style "S"—the only Master Collet with no work pressure on the screw
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Also Hardinge-Sjogren Chucks, Draw-In Collets, and Collet Index Fixtures for accurate work holding and increased production.

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HARDING-SJOGREN Speed COLLET CHUCK

HARDINGE DRAW-IN COLLETS FOR ALL LATHES AND MILLERS

HARDINGE COLLET INDEX FIXTURES

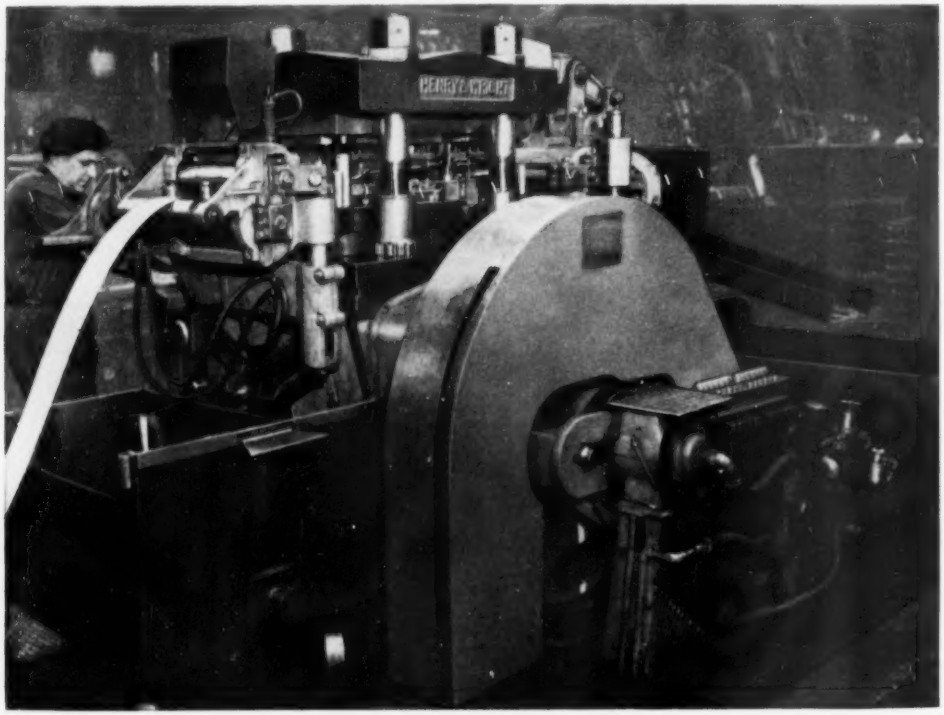
It Pays Three Ways To

First, you can combine operations — use progressive dies for metal stamping jobs that normally would require several presses. Second, you get high speed at no sacrifice in quality of work. Third, you get longer die life.

These benefits are inherent in the design of the Henry & Wright Dieing Machine. It is built to give them. Note low center of gravity — flywheel, crankshaft, connection are below the punchholder. This permits high speed, but minimizes vibration.

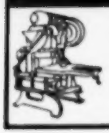
Maximum guiding surface is provided in the four-post punchholder guide, assuring constantly accurate alignment. A pulling stroke is applied to the die and the punchholder takes only the load required to do the work in the die. Any angular thrust from the crankshaft is absorbed by the lower crosshead.

For more pieces per minute and between grinds — for less handling and more finished work — modernize with Henry & Wright Dieing Machines. They are precision-built to do precise work.



In Chrysler's Highland Park Plant, Henry & Wright Dieing Machines are used to make fluid coupling fins and torque converter impeller blades. Note the low center of gravity of the Henry & Wright Dieing Machine. It allows high speed with minimum vibration.

OTHER EMHART PRODUCTS INCLUDE:



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THE V & O PRESS CO.
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HARTFORD 2, CONNECTICUT

AUTOMATIC PACKAGING EQUIPMENT
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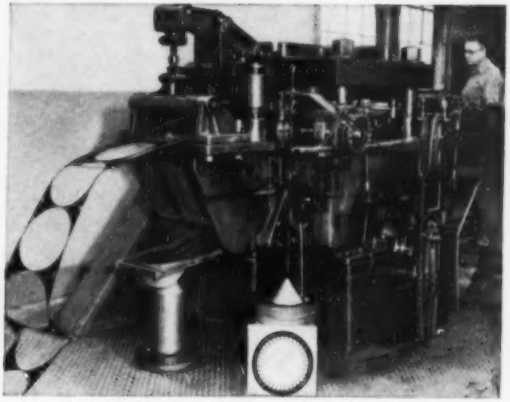
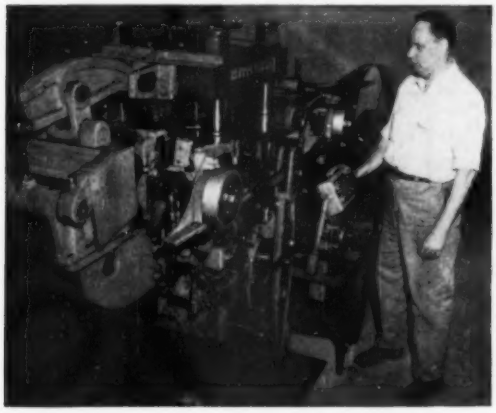
PLASTIC BOTTLES, RODS, TUBES, SPECIAL SHAPES
PLAX CORPORATION
Subsidiary of Emhart Mfg. Co.
HARTFORD 1, CONNECTICUT

Modernize Metal Stamping-
with Henry & Wright Dieing Machines

Knapp-Monarch Produces completed rotor and stator laminations for its electric motors on 25-ton and 50-ton Henry & Wright Dieing Machines. Both pieces are made at once, at speeds substantially in excess of equipment previously used.



Rotor and Stator Laminations are made simultaneously of silicon steel on 150-ton Henry & Wright Dieing Machines at Fairbanks, Morse & Co. Unique feature of H & W design is that the upper crosshead takes only the pressure required to do the work in the die.

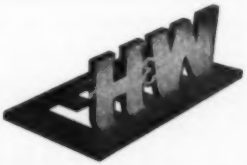


Numerous Types of motor laminations are made on the Henry & Wright Dieing Machines operating at General Industries. This illustration shows another unique advantage of these machines — the four post guide to the upper crosshead, which assures accurate and constant alignment.

Only the best is good enough

FACT PACKED CATALOG

Complete descriptions of all Henry & Wright Dieing Machines. Write: Henry & Wright, 481 Windsor St., Hartford 5, Conn.



HENRY & WRIGHT
Division of Emhart Mfg. Co.

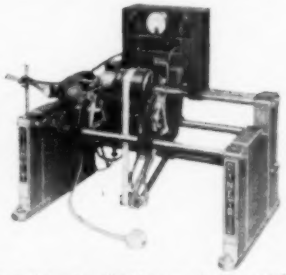
the final *check* for every rotating part...

Maybe it's a crankshaft or an armature . . . perhaps a fan or a belt pulley. No matter. The important thing is this: If it isn't *balanced*, it isn't ready for service.

Smooth operation and long life require that accurate static and dynamic balance be rated right along with mechanical specifications . . . incorporated in the blueprints. Then, no vibration, however slight, may lower the efficiency of the finished product.

Gisholt Balancing Machines can locate and measure unbalance vibrations down to .000025" with simple readings . . . handle any assembly from ½ ounce to 50 tons.

The cost? Very moderate. That's why so many manufacturers insist that their products have the final check which only Gisholt Balancing Machines can provide.



Gisholt Balancing Machines, made in a variety of sizes and types, can also be furnished with correction equipment designed to meet your specific requirements.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

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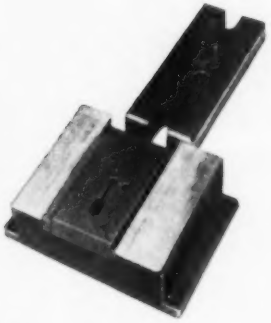
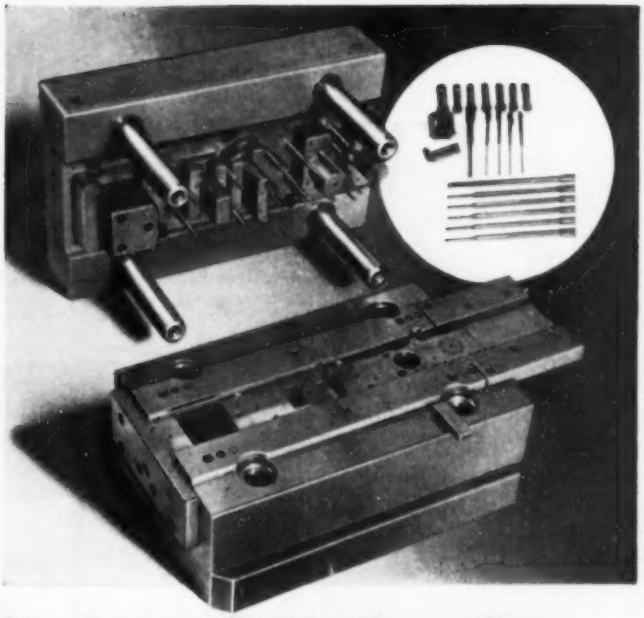
DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES





from simple notching . . . to complex rotor-stator jobs . . .

you get more carbide benefits from Carboloy dies

Your blanking, forming, drawing and piercing dies take a terrific beating in day-to-day use. That's why it always pays off to always use Carboloy Cemented Carbide in your dies and punches.

From simple dies costing but a few hundred dollars to complex dies costing many thousands of dollars, applications of Carboloy Cemented Carbides offer greater production, less downtime and maintenance, fewer rejects, longer die life . . . *all* the benefits that only Carboloy Cemented Carbides and engineering services can give.

To enjoy all carbide benefits

You or your die maker may order Carboloy Cemented Carbide made to your specifications in rough-finished form. Final finishing and assembly into your dies is easily accomplished in your own toolroom or by your die maker.

We'll work with you

Carboloy Field Engineers are carbide *specialists*, ready with *on-your-job* answers to trouble-shoot tough die problems . . . or to help design new carbide applications for improved performance.

We'll train your personnel

At the Carboloy Training School, your key toolroom personnel will learn latest carbide techniques and applications. Become expert in the finishing and servicing of carbide dies to increase die life, assure top production.

We'll send you technical data

The Carboloy Die Engineering Manual is a handy, all-inclusive guide that shows you how easy it is to design, apply, use and maintain carbide dies. It will save you time. It will save you money. Use the handy coupon below to get your copy.

Why not get the full story on long-wearing Carboloy dies? Call your local Carboloy representative, or use the convenient coupon to get the data you're interested in.

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11149 East 8 Mile Blvd., Detroit 32, Michigan

Plants at Detroit, Michigan; Edmore, Michigan; and Schenectady, New York

Magnet ideas for the shop!

Use Carboloy Permanent Magnet Sheet-Steel Separators to prevent feeding of doubles. And use permanent magnets to give an extra "hand" all around your shop. They're great for magnetic stands, tool-holding devices, sweeper's "pickup" tools, magnetic paper grippers on machines, containers for small parts, and magnetic retrievers. Write for Carboloy Permanent Magnet Stock Catalog, PM-100. (Use coupon →)

CARBOLOY Department of General Electric Company
Detroit 32, Michigan

We are interested in the Carboloy Services checked below:

☐ Die Training School ☐ Die Engineering Manual, D-124 ☐ Have a Carboloy Field Engineer call ☐ Send Carboloy Permanent Magnet Stock Catalog, PM-100

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COMPANY_____ POSITION_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

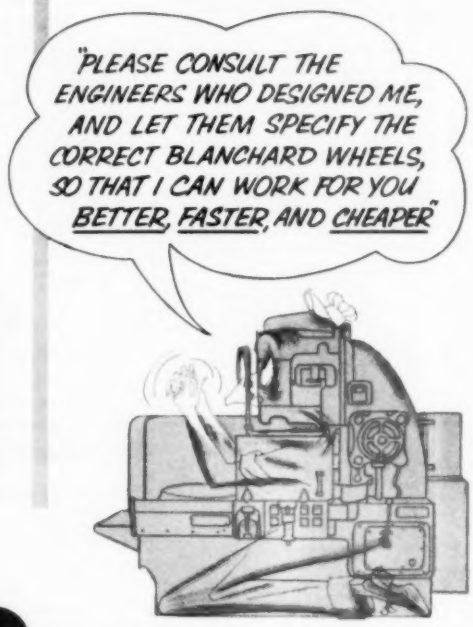
UNCLE!

Are your machines begging for mercy because of misuse?

Blanchard Grinders, *with proper grinding wheels, can* and *do* give high production with extremely close tolerances for dimension and flatness. However, a No. 11 Blanchard user recently received erroneous advice on abrasive wheels from an outside source. The result was that 35 high-speed cam plates were ground on both sides in 1¼ hours with surface finish of 24 micro-inches.

By referring the problem to Blanchard, it was easily demonstrated that the No. 11, with correct grinding wheel, would give desired results—90 to 100 cam plates per hour, with surface finish of 4 micro-inches, dimension tolerance of ±.0002, and flat within 2 light bands.

Blanchard wheels are best for Blanchard Grinders — let Blanchard give you the benefit of their vast experience so that you too can get the most from your Blanchard machines.


"PLEASE CONSULT THE ENGINEERS WHO DESIGNED ME, AND LET THEM SPECIFY THE CORRECT BLANCHARD WHEELS, SO THAT I CAN WORK FOR YOU BETTER, FASTER, AND CHEAPER"

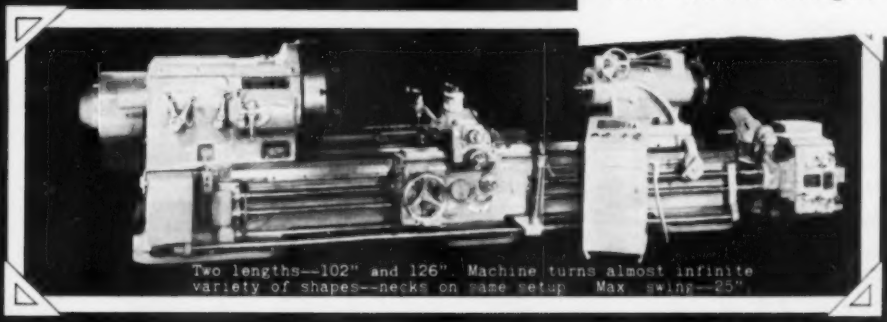
Information on correct surface grinding procedure and wheel selection are given in "Work Done on the Blanchard" and "The Art of Surface Grinding." Write for free copies today!

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

A SNAP FOR STEEL PRODUCERS!

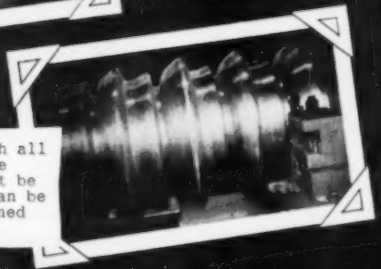
This Tracer-Controlled Monarch Heavy Duty Roll-Turner Produces 3 to 6 Times Faster! Offers Many Other Great Advantages.



Two lengths--102" and 126". Machine turns almost infinite variety of shapes--necks on same setup. Max. swing--25".

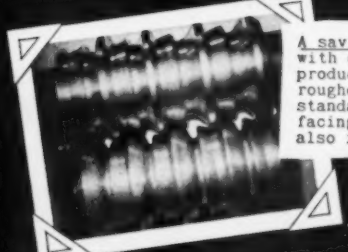
1st HOUR

Facing begun on first of pair of rail section rolls. Body of roll--40-1/2". Rolls are 1.56% carbon, 0.77% nickel, 1.13% chromium. Total metal removed, 3730 lbs. per roll.



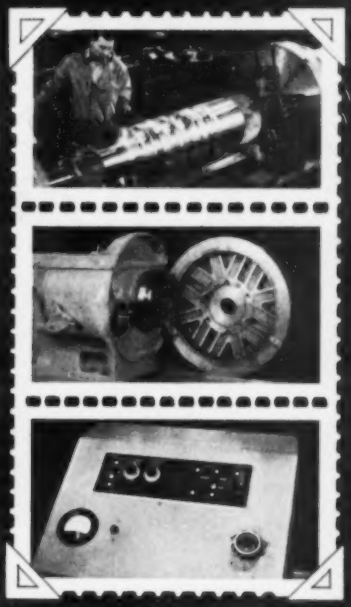
10th HOUR

Roughing completed. With all rolls from given template identical, rolls need not be matched in pairs. One can be redressed or new one turned with assured match.



26th HOUR

A savings of 99 hours compared with conventional roll lathe production. Both rolls faced, roughed and finished. Only standard carbide round nose and facing tools used--a huge savings also in form tool inventory.



TOP - Another typical operation.

CENTER - Face plate removed. Power applied far from work axis on large diameter rolls.

BOTTOM - Complete push button control exclusive with Monarch.

Focus on Monarch for all your turning needs

Monarch
TURNING MACHINES

FOR A GOOD TURN FASTER
...TURN TO MONARCH

THE MONARCH MACHINE TOOL CO., SIDNEY, OHIO
Please send me without obligation your complete illustrated Heavy Duty Roll-Turner Booklet No. 1302.

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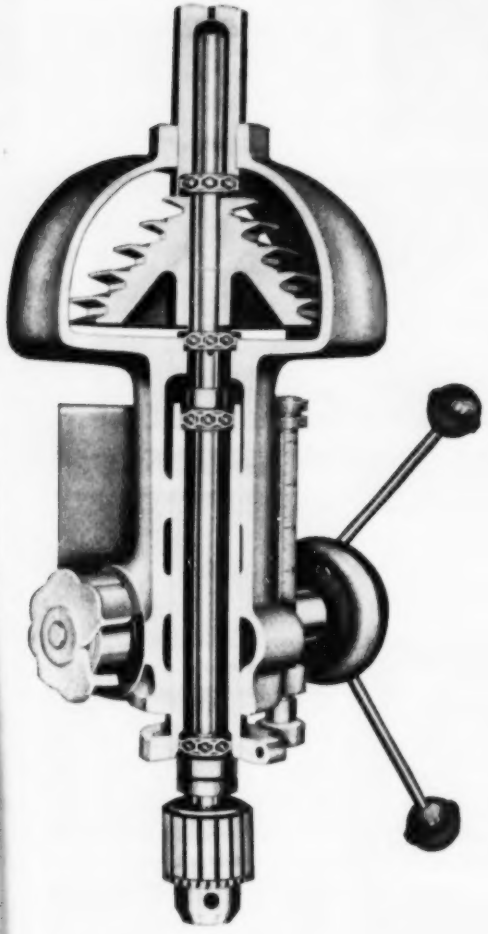
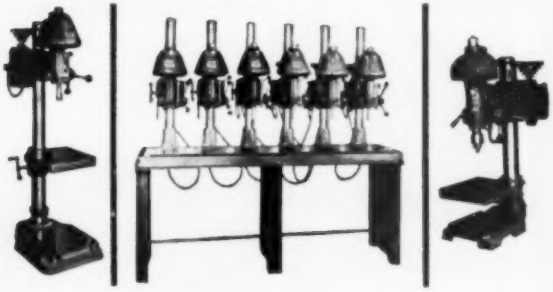


top quality

Top-quality head construction with full floating spindle drive and four sealed-for-life ball bearings —plus C-O Cincinnati's exclusive hinged motor bracket that makes belt-shifting a snap—are two of many practical features that make 16" and 18" Royal bench and floor drills "of outstanding value."

These precision drilling units, backed by a nationally recognized builder of fine machine tools, give you more quality features at economy prices. Prove it yourself. Run a Royal for half a minute and you'll get the feel of quality construction: smooth operation, and fast work. Shipped from dealer stocks near you. Write for Catalogs D-100 and D-101, and the name of your nearest representative.

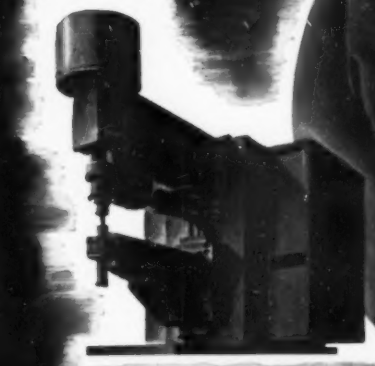


CANEDY-OTTO DIVISION

CINCINNATI 9, OHIO, U.S.A.

cincinnati lathe & tool co.

UNIVERSALLY ACCEPTED



the largest

resistance welding

machine manufacturers

in the world

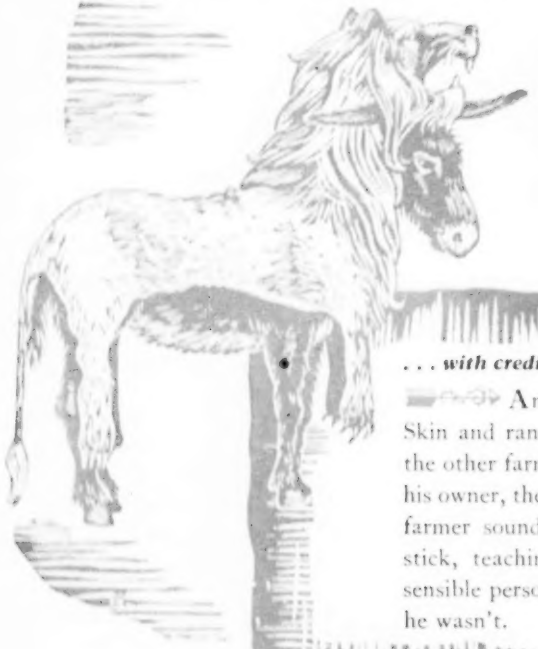
SCIAKY

4915 West 67th Street

CHICAGO

Plants at London, Paris

"The Ass in the Lion's Skin"



is a story for Cutting Fluid users

. . . with credit to Aesop, the Fable-Maker

An Ass dressed himself up in a Lion's Skin and ran about scaring the daylights out of the other farm animals. Then he tried to frighten his owner, the farmer. That was his downfall. The farmer soundly beat the stupid ass with a big stick, teaching him that he couldn't fool any sensible person by parading around as something he wasn't.

The Moral:

Different types of cutting fluids have their respective places in machining. Dressing a coolant up in a "Lion's Skin" doesn't change its capabilities. For example, if you have a difficult broaching job on a soft, tough steel *more than a "coolant" is needed.* You need the high *anti-weld* properties, the high *lubricity* and the superior temperature regulating qualities of a product like Stuart's ThredKut 99.

Stuart offers you a combination of time-tested products and wide experience in their application. You gain from this fewer rejects, longer tool life and greater production—often with *fewer* different cutting fluids in your plant. Ask to have a Stuart Representative demonstrate how he can save you time, money and material.

More Than a "Coolant" is Needed

D. A. Stuart Oil Co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2727 S. Troy St., Chicago 23, Ill.

SEND FOR BOOKLET *entitled More Than a "Coolant" is Needed*

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL

to D. A. Stuart Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.

Your Name .....

Title .....

End Mills that Save Down-Time

Precision-made end mills that meet the highest standards of cutter design have advantages especially important in fulfilling today's high production requirements. They cut faster, more freely, and with less power. Their greater wearing qualities enable them to turn out more work between sharpenings — reduce machine down-time.

Brown & Sharpe End Mills are made under exacting quality control, from start to finish. In both steel formula and heat treatment, they are closely held to rigid specifications. Careful machining maintains consistent adherence to design standards.

To assure maximum productivity from your milling machines, specify end mills and other cutters from the complete Brown & Sharpe line. Write for Catalog.
Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

Extra-long, fast spiral

Long, two-flute, fast spiral

Fast spiral, double end

Ball end, two-flute, fast spiral

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S

How else could this job be done

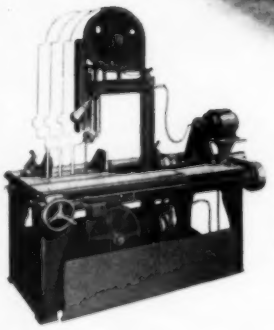
so easily, so accurately and so inexpensively?

Segmentation of 42" Steel Casting

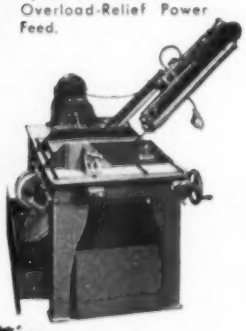
Every tool room, machine shop, die shop and maintenance department needs at least one No. 8 MARVEL Metal-cutting Band Saw for cutting off anything from ⅛" drill rod to bars or billets of 18" x 18" cross-section . . . for roughing large work to size and shape, thereby saving hours of machining . . . for those occasional "trick" jobs, impossible on any other saw, that bob up in every plant.

Odd shapes that can't be held in the removable, quick-action vise, are easily set-up on the No. 8's large, T-slotted work table. MARVEL Overload-Relief Power Feed insures accurate cuts under the most adverse conditions because blade pressures are automatically held within limits which are pre-set instantly for each job. The blade is never forced beyond its capacity to efficiently and accurately remove metal . . .

Close limits are further assured through the work being clamped rigidly to the bed of the saw and the blade power-fed through it instead of pushing the work through the blade. This is also true in miter cutting, as the blade column—*not the work*—is swung to the required angle. The handiest, most versatile machine tool, it is also the busiest in most shops.



This double exposure illustrates how the blade maintains its vertical position while moving into and through the work, impelled by the automatic MARVEL Overload-Relief Power Feed.



Column set at angle to cut 45° miter on 18" beam. Entire saw column can be swung to cut at any angle from vertical to 45° right or 45° left.

MARVEL *Metal Cutting* **SAWS**

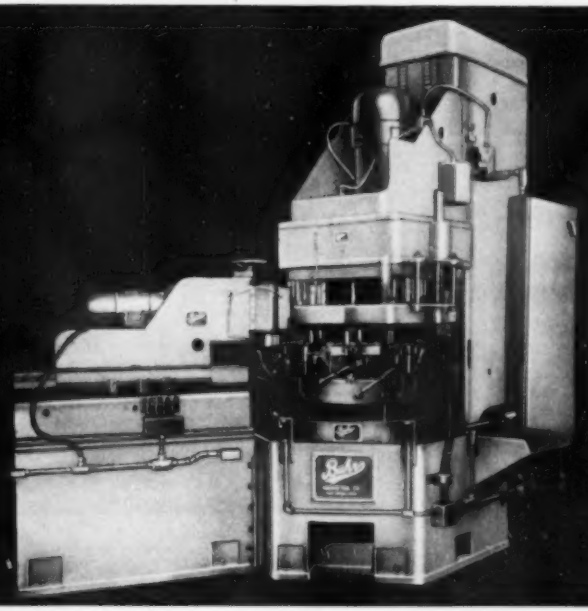
Better Machines-Better Blades

Write for Catalog

ARMSTRONG-BLUM MANUFACTURING CO.

5700 Bloomingdale Avenue *"The Hack Saw People"* **Chicago 39, U. S. A.**

NO JINX NOW FOR JUDY OR JANET



Once, it took a man to drive a car.... Now it's second nature for teen-ager Judys and grandma Janets to drive them.... Easy or effortless to shift gears... easy to steer... to brake and accelerate... even easier to own the cars—thanks to modern automotive engineering and production!... Here's one of the reasons—Production Equipment to make the parts for modern cars.... Equipment like this Buhr Two-Way Hydraulic-Feed Milling, Drilling and Tapping Machine—one Machine which an Automotive Giant depends on morning-noon-and-night to process Water Outlet Connections for modern engines—to manufacture parts so well and so economically ... that driving a car is no longer a jinx for Judy or Janet!

Modern Auto-Making Economy Achieved by This Type of 2-Way 6-Station Unit

In the constant competitive combat of the auto industry, every company strives persistently for greater production efficiency. Always, they try to group manufacturing operations to keep costs to the minimum. Recently, to produce a new part for a revolutionary engine, one of the auto companies decided to group operations in one machine.

One of Their Problems

To mill, drill and tap a Water Outlet Connection—that was their immediate problem. To make the Equipment to handle this phase of their production, they called in Buhr.

What the Machine Does

In general—it mills mounting Flange; combination drills and reams 2 holes and spotfaces small Flange surface; combination bores 2 holes and drills 2 holes; combination counterbores and countersinks 2 holes, and combination drills and reams 2 holes, and taps 2 holes.

Specifically, the Machine does this—

Station 1—Load and Reload

Station 2—Mills mounting Flange surface

Station 3—(1st Position) Combination drills and reams (2) .406 dia. holes; (2nd Position) Spotfaces small Flange surface to 2.320 dia.

Station 4—(1st Position) Combination bores (2) .350 dia. and (1) .440 dia. bore; (2nd Position) Drills (2) .257 dia. holes.

Station 5—(1st Position) Combination counterbores (2) .570 dia. and (2) .06 dia. holes; (2nd Position) Countersinks (2) 90° x .280 holes.

Station 6—(1st Position) Combination drills and reams (2) .328 dia. holes; (2nd Position) Taps (2) $\frac{5}{16}$-18 Class 2 holes.

PRODUCTION—144 Parts at 100% Efficiency.

Why Buhr Was Chosen

For more than a quarter-century, Leading Auto Makers have depended on Buhr for efficient production. . . . Especially in the field of Multiple-Spindle Drill Heads, the name of Buhr has long meant the finest.... Buhr's manufacturing facilities are excellent. . . . In sales, engineering and production, Buhr has trustworthy and experienced staffs—the kind of staffs these leading Auto Giants turn to when production problems call for this type of Special Machinery.

For Details About BUHR

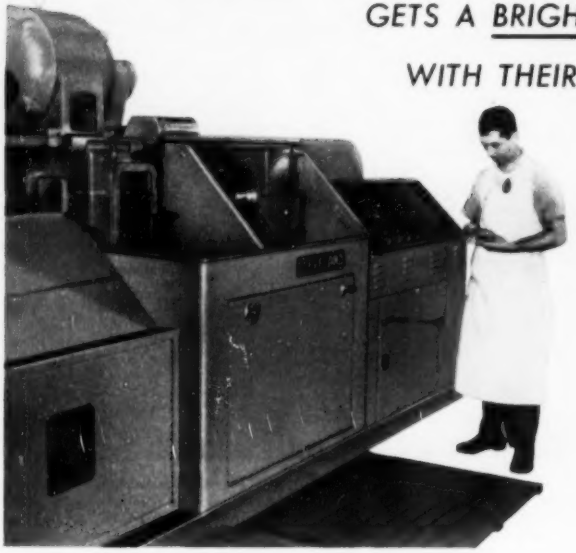
A comprehensive Catalog . . . or a personal call from a Buhr Sales Engineer . . . is yours for the asking wherever you are located in the United States! . . . For every problem involving this type of Special Machinery—including the type which helps beat the jinx for Judy and Janet—phone, wire or write us.

BUHR MACHINE TOOL CO.
Ann Arbor, Michigan
Phone: Ann Arbor 2-5646—5980
Detroit W Oodward 3-2126

Buhr ***SPECIAL MACHINERY... Leaders Make Sure With BUHR***

FAIRCHILD
CAMERA AND INSTRUMENT CORPORATION

GETS A BRIGHTER PRODUCTION PICTURE WITH THEIR NEW CLEVELAND DIALMATIC



Model AB Cleveland Dialmatic 3" Single Spindle Automatic at Fairchild Camera and Instrument Corp. Shown below are a few of the parts produced, typical of those used in the manufacture of Fairchild Aerial Mapping and Reconnaissance Cameras, Potentiometers and many other precision electrical-mechanical products.

PLUG
2-9/16" dia.
B1113 Steel
1.93 min. per piece

SPUR GEAR
1¾" dia. Aluminum
1.74 min. per piece

SCANNER DRUM FITTING
2¾" dia.
Aluminum
2.04 min.
per piece

CLUSTER GEAR
2⅜" dia. Aluminum
2.34 min. per piece

PLUG
1⅞" dia.
B1113 Steel
1.20 min. per piece

Fairchild production engineers report *outstanding* time savings on their screw machine parts production with the new 3" Cleveland *Dialmatic*. A comparative study of machining times covering a variety of parts (five of these are illustrated at right) shows that their Cleveland has scored production increases ranging from 82 to 471%.

This Cleveland *Dialmatic* makes full automatic production of short-run jobs *economical*, because set-up time is *short*. Cleveland's exclusive *Electric Feed Drive* operates all five turret tools. Highly accurate forward and return tool feed rates are set simply by turning dials on the control panel. There are *no* cams to change; *no* time-wasting, set-and-try mechanical adjustments necessary. You can *tune* the job to maximum production while the turret tools are cutting.

The Model AB *Dialmatic* is made in 2½" and 3" capacities. There are 112 spindle speeds, from 24 to 1820 r.p.m., available in the 2½" machine; 98 speeds, from 24 to 1402 r.p.m., in the 3" machine. That gives you a broad range of cutting speeds suitable for all metals — all types of tools. And do you have an occasional chucking job to run? The Model AB Cleveland is quickly converted to a *chucker* having 6" swing!

Call in a Cleveland engineer. Let him discuss with you the economies a Cleveland *Dialmatic* can make for your plant. For a quick but complete description of this most versatile of all automatics, write for Bulletin "AB".

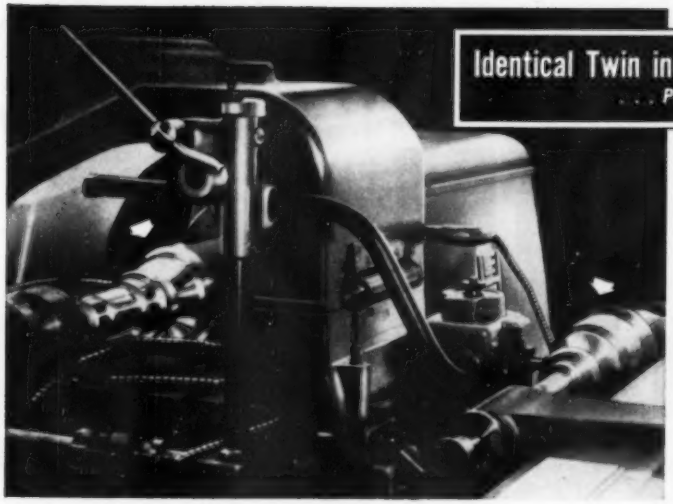
Remember, Clevelands Cut Costs!

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

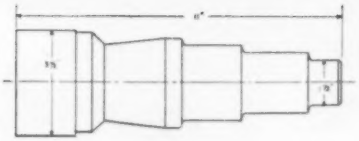
Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

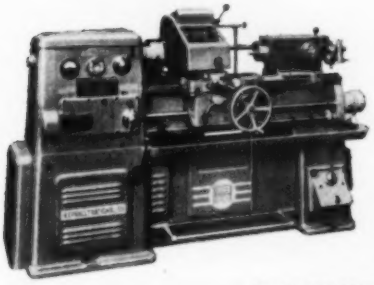


Identical Twin in Less than Four Minutes

. . . Produced on the

HIGH SPEED HYDRAULIC COPYING LATHE





Examine this miracle of modern engineering made possible by the H.E.B. High Speed Hydraulic Copying Lathe. Pictured at the right is the turned master; at the left you see its identical twin — a shaft of S.A.E. 4130 steel accurately copied in just 3¾ minutes. That's breath-taking speed for such precision finish.

The H.E.B.'s patented tracer device is built into this ruggedly constructed lathe. There are no troublesome attachments, and *setting time takes no more than 10 to 20 minutes.* Experience on production lines proves time and again that finished parts are copy-turned up to 300% faster than on multi-tool lathes!

With its 20 H.P. motor the **OP Model** takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. **GT Models** with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

More than 1000 of these modern copying lathes are now in use worldwide . . . designed and built in France by H. Ernault Batignolles, manufacturers of machine tools for almost a hundred years.

Catalogs on both of these machines, including complete specifications, are available upon request. Write or telephone now for catalog or demonstration.

TYPE 178 CONSTAN CARBIDE TOOL GRINDER

The Constan Grinder is specially designed for sharpening carbide tools, etc., without attachments . . . lengthens their life and improves cutting capacity. Heavily built, the Constan combines smooth operation and ease of setting with great rigidity. The inclinable table incorporates a ball and socket vise so that the tool may be clamped in any position. Two diamond wheels — one for roughing and one for finishing — are mounted on the wheel head, and each may easily be brought into position. The machine may also be used for sharpening milling cutters.

H·E·B

"THE WAY TO TURN"

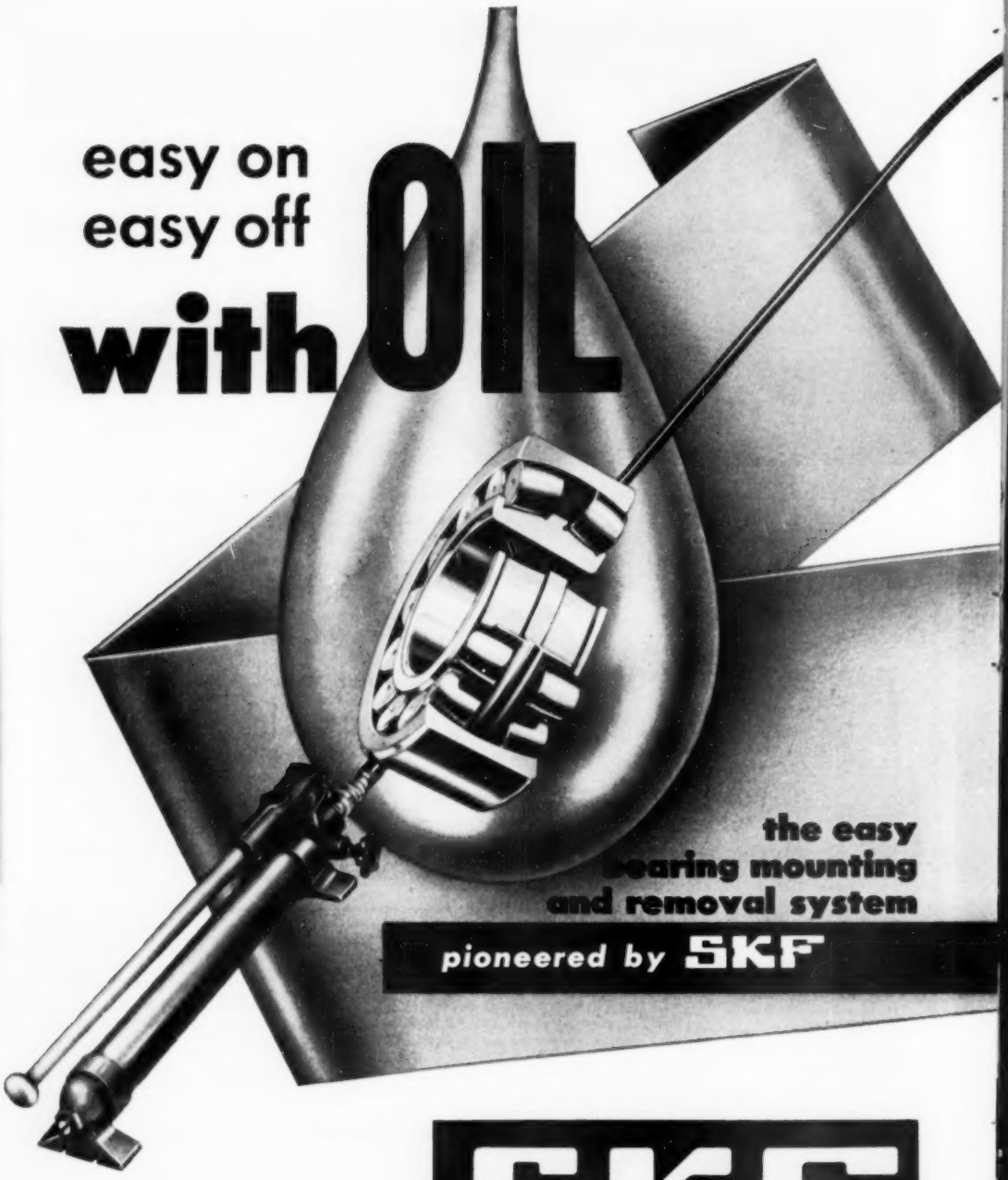
IMMEDIATE DELIVERY

H. E. B. MACHINE TOOLS, INC.

475 FIFTH AVENUE, NEW YORK 17, N. Y.

Telephone: LExington 2-0266

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS



SKF®
BALL AND ROLLER BEARINGS

No designer today has to be sold on the advantages of anti-friction bearings. However they *used* to pose one serious problem to machine designers — that of the difficulty of mounting and removing interference fits, especially in bearings of comparatively large size. *Not so today.*

In the System of Hydraulic Removal, developed by SKF, OIL does the work. With simple equipment, you force oil between the shaft and the bearing, pressure breaks the fit, and the bearing slides off quickly, easily, safe from damage to bearing or housing. The same system eliminates the need for driving the tapered bore bearing *on* the shaft, or heating to obtain a shrink fit.

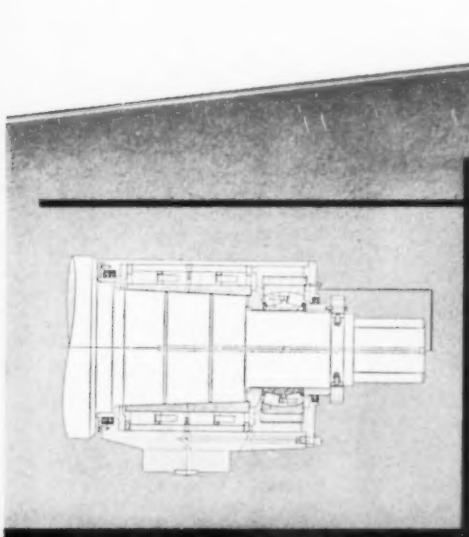
The accompanying illustrations show a few of the successful applications of this SKF principle —on roll neck bearings in steel mills, printing cylinder and paper mill roll bearings, on SKF "OK" Shaft Couplings, main and crank pin bearings in air compressors. The principle is also well suited to other equipment such as crushers, construction machinery, etc.

SKF's first patent application on the hydraulic mounting principle was made in 1943.

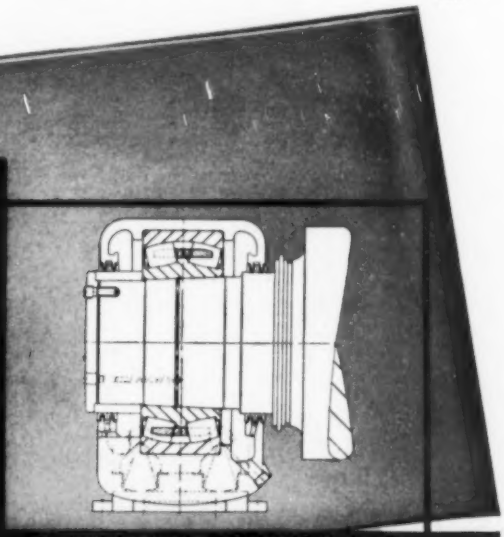
Since then, more and more equipment designers are taking advantage of this SKF "first." For further details, write for SKF Brochure No. 344.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA. —*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.*

7361

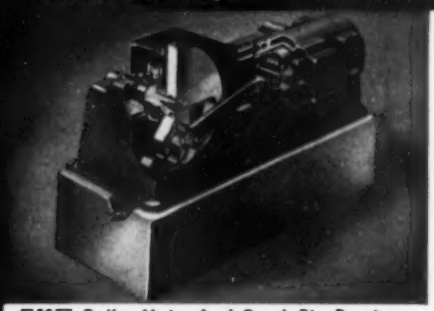


Typical Application Of SKF Hydraulic Mounting For Roll Neck Bearing.



Typical Application Of SKF Hydraulic Mounting For Printing Cylinder And Paper Machine Roll Bearing.

"OK" Coupling On 7 3/8" Marine Shaft, Depends On Pressure Only To Transmit Torque. Separable By SKF Hydraulic System.

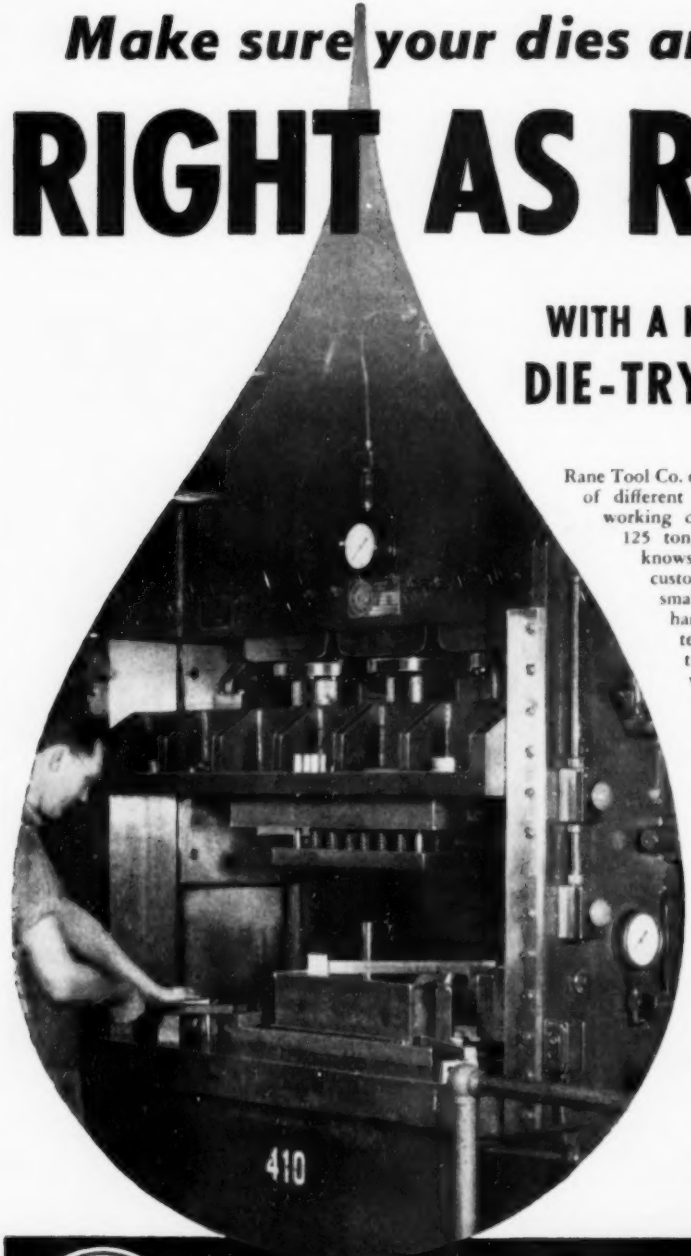


SKF Roller Main And Crank Pin Bearings With Hydraulic Mounting Feature On A Pneumatic Compressor.

Make sure your dies are always

RIGHT AS RANE!

WITH A KRW HYDRAULIC DIE-TRYOUT PRESS!



Rane Tool Co. of Jamestown, N. Y., makes hundreds of different dies for America's leading metal-working companies. Thanks to their KRW 125 ton, 3-cylinder Hydraulic press, Rane knows their dies will work perfectly in the customer's plant. Some Rane dies are small enough to fit in the palm of your hand; others are big babies that take ten men to lift. And all of them are tried out on this KRW press. It's working 95% of every day. And the Rane people tell us it's the most versatile piece of equipment in their shop.

Whether die-making itself is your business, or whether you make dies for your own production use, a KRW die-tryout Hydraulic press will soon pay for itself in time and money saved. With a KRW press in your machine shop you *know* dies will work in production before they leave the shop. There's a KRW Hydraulic press to meet any metalworking problem. 25 - 150 ton capacities, all self-contained above ground; one, two and three cylinder models; hand operated, air operated or motor driven.

•

Ask your machinery dealer to quote you or write, wire or phone Dept. 11 for full facts, prices and delivery dates.

SINCE 1916 KRW A MARK OF DEPENDABILITY

K·R·WILSON

Designers and builders of hydraulic presses to meet any metal working problem

215 MAIN STREET • BUFFALO 2, N. Y.

HERE'S THE COMPLETE "ACORN" STORY — a Body, a Die, a Cap. Put them together and you have a really positive, rugged and accurate high production threading tool. And the test plug packed with every "Acorn" Die is tangible proof that it has been **performance tested** at the factory. Cutting sizes .0 80 to $1\frac{1}{2}$"-12." Holders, including a releasing model, for many types of machines.

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS

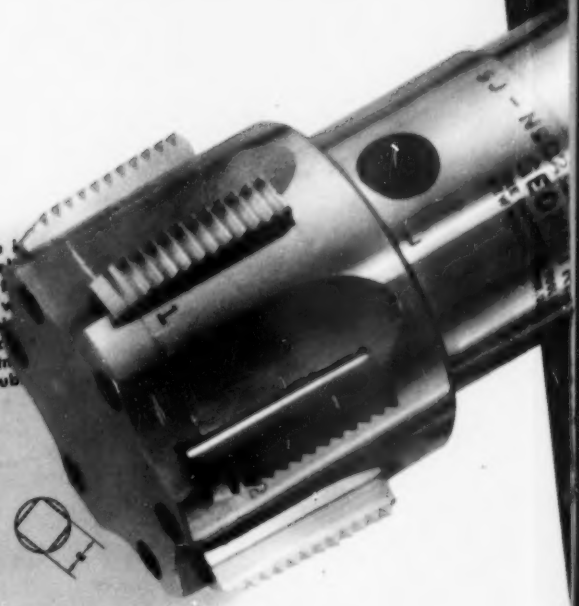
GEOMETRIC SJ

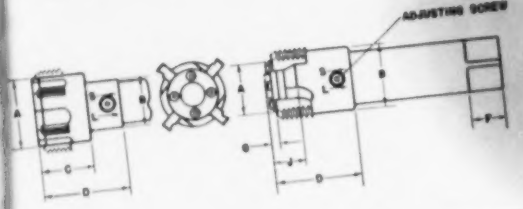
Bulletin SJ 4 pages

solid adjustable tap

Class SJ

Where time for backing out is unimportant, where space is limited, or wherever a solid tap is desired, the Class SJ Solid Adjustable Tap is recommended. Within its size range, this simple tap will do any job that a conventional solid tap will do, and in addition can be adjusted to required decimal sizes or fits. Furthermore it may be used for more than one size pitch by the use of interchangeable chasers. Its compactness makes the SJ ideal for machines demanding a short, stubby tap, or when overhang must be avoided.





SPECIFICATIONS CLASS SJ TAPS

Style and Size Inches	CAPACITY: Straight Threads: Diam. Inches	Depth	Coarsest Pitch	Std. Pipe Thds.	Code Word	A	B	C	D	E	F	G ◦	H aa	SHANKS: Standard: Dia.	Lgt.	Morse Taper	Also available: Max.: Dia.	Lgt.	Min.: Dia.	Lgt.	CHASERS
SJ-1	1 5/16–1 5/8	Limited Only by Diameter and Length of Shank	11	1*	Esser	1 1/32	1 5/32		2 1/8	5/8	5/8	5/32	1/32	.27/32	1	5	4	1 1/4	5	3/4	1 1/2	4
SJ-1 1/4	1 5/8–1 15/16		11	1 1/4	Eclat	1 7/32	1 1/8		2 1/2	15/16	15/16	5/32	1/32	5/8	1 1/4	5	4	1 1/4	5	3/4	1 1/2	4
SJ-1 1/2	1 15/16–2 1/4		11	1 1/2	Edify	1 1/8	1 3/8		2 1/8	1 1/8	1 1/8	3/16	1/16	7/8	1 1/2	5	4	1 1/2	5	1	2	4
SJ-2	2 1/4–2 5/8		11	2	Educe	1 5/8	2 1/16		2 1/4	1 1/2	1 1/2	3/16	1/16	1	2	5	4	2	5	1	2	4
SJ-2 1/2	2 5/8–3 1/2		8	2 1/2	Egypt	2 1/8	2 1/8		3 1/8	1 11/16	1 11/16	1/4	1/16		2 1/4	6 1/4	5	2 1/4	6 1/4	1 1/4	2 1/2	4
SJ-3	3 1/2–4 1/4		8	3	Eland	3	2 1/8	2 1/2	4 1/4	1 11/16	1 11/16	1/4	1/8		2 1/4	6 1/4	5	2 1/4	6 1/4	1 1/4	2 1/2	6
SJ-3 1/2	4 –5		8	3 1/2–4	Elect	3 1/2	2 1/2	2 1/2	4 1/4	1 11/16	1 11/16	1/4	1/8		2 1/4	6 1/4	5	2 1/8	6 1/4	1 1/4	2 1/2	6
SJ-4	4 1/2–5 1/4		8	4 –4 1/2	Elfin	4	3 1/2	3 1/8	5 1/8	2 1/4	2 1/4	1/4	1/8		3	8 1/8	6	3	8 1/8	1 1/2	3	6
SJ-4 1/2	5 –6 1/2		8	4 1/2–5	Elion	4 1/2	3 1/8	3 1/8	5 1/8	2 1/4	2 1/4	1/4	1/8		3	8 1/8	6	3	8 1/8	1 1/2	3	6
SJ-5	5 1/2–7 1/4		8	5 –6	Ember	5	3 1/8	3 1/8	6	2 1/16	2 1/16	5/16	1/8		3 1/8	8 1/8	6	3 1/8	8 1/8	1 1/2	3	6
SJ-6	6 1/2–8 1/2		8	6 –7	Epoch	6	3 1/8	3 1/8	6	2 1/16	2 1/16	5/16	1/8		3 1/8	8 1/8	6	3 1/8	8 1/8	1 1/2	3	6

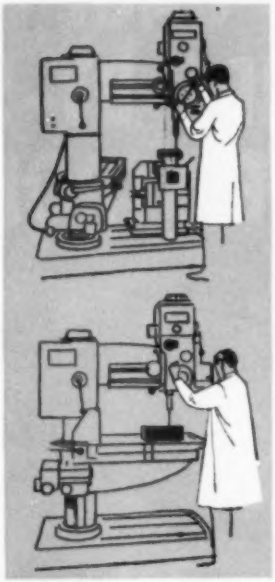
Chasers interchange in Class "S" Taps.
‡Standard straight shanks are furnished unless otherwise specified.
◦ G = Distance from front of Chaser to front of Cap.
NOTE: Separate taps recommended for right and left hand tapping. Taps for right hand furnished unless otherwise specified.
* 1" Pipe recommended only for free cutting materials where work has been taper reamed to size.
Standard straight shanks will be tapered per dimensions "E" and "F" without extra charge. Where required, ends of shanks will be tapered per dimensions "E" and "F" without extra charge.
aa H = Amount projection Chasers extend beyond Cap.

GEOMETRIC TOOL COMPANY DIVISION
Greenfield Tap and Die Corporation
NEW HAVEN 15, CONNECTICUT

DRILL AND TAP

ON BASE OR TABLE

with Fosdick's Sensitive Radial



Think of it! With a *single* machine you can drill and tap small parts on the table — large parts on the base.

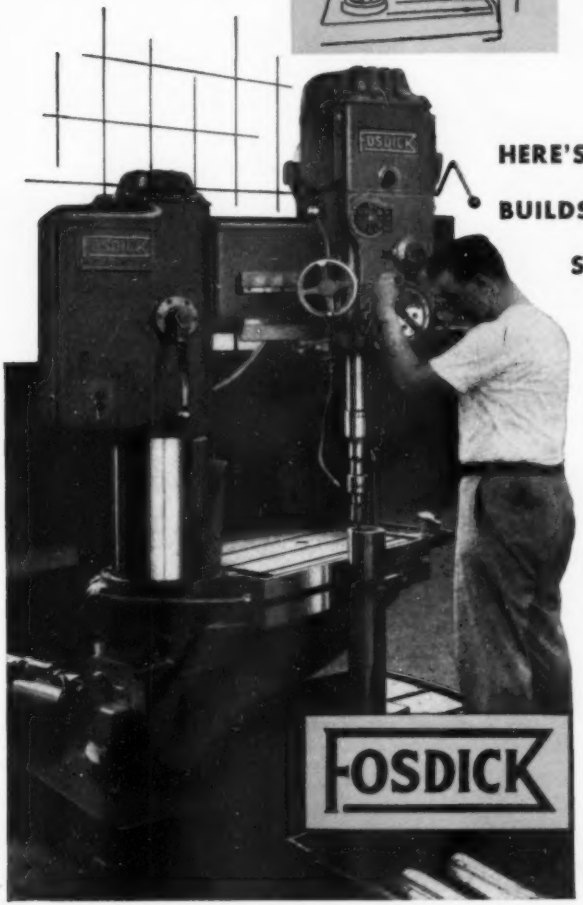
Drill holes up to 1½". Tap with Fosdick's special Automatic Tapping Control* that saves time by returning the spindle to forward rotation the instant the tap clears the work.

Imagine the convenience of the fixed-height arm that swings 360° — controls are always handy. And the table adjusts to exactly the right height for your work, or swings out of the way. No other drill gives you this versatility and convenience.

Can't *your* shop benefit from the volume and variety of work this combined sensitive and radial can produce? And so economically!

Get the facts from your nearby Fosdick Distributor. If this isn't convenient, write us today for Bulletin SRA.

* Available as extra equipment.



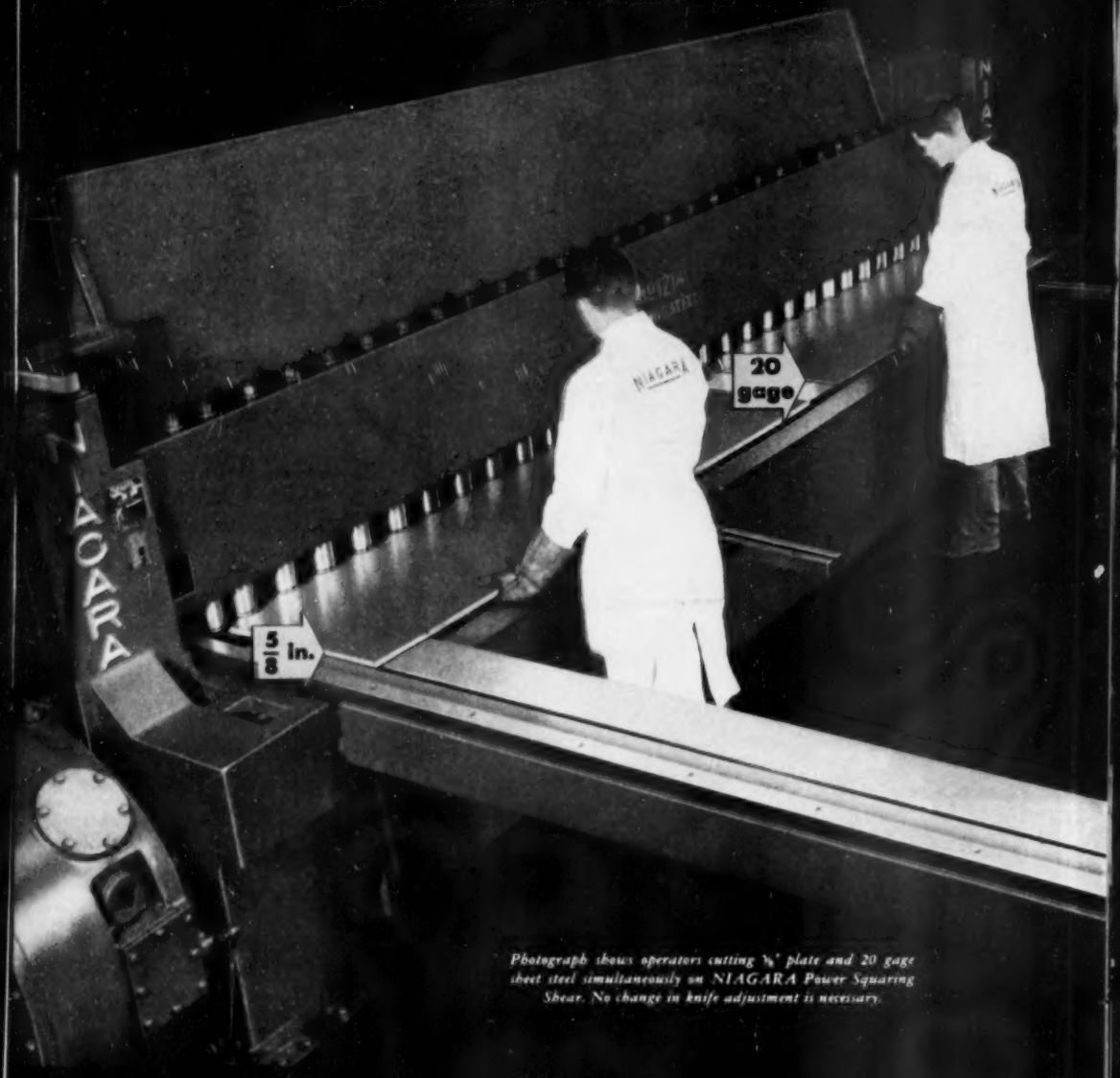
HERE'S HOW *Lodge and Shipley* BUILDS LATHES WITH THE HELP OF SENSITIVE RADIAL VERSATILITY

Clamped to the vee on the table is a tailstock spindle. Operation: drill, chamfer and tap 4 holes. 17/64" drill, 1020 rpm, .004 ipr, ⅞" deep. Chamfer, 1020 rpm. Tap 5/16" x 18 thread using Automatic Tapping Control, 240 rpm, ½" deep. And Lodge & Shipley uses their Sensitive Radial for a variety of other work including steel tool blocks, levers and multiple-drilled cam plates.

THE FOSDICK MACHINE TOOL CO.,
CINCINNATI 23, OHIO

RADIAL DRILLS · SENSITIVE AND UPRIGHT DRILLS
JIG BORERS AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

CUTTING 20 GAGE and 5/8" PLATE SIDE-BY-SIDE AT ONE STROKE



Photograph shows operators cutting ⅝" plate and 20 gage sheet steel simultaneously on NIAGARA Power Squaring Shear. No change in knife adjustment is necessary.

The ability of Niagara Power Squaring Shears to cut thick and thin plate both at the same time with the same knife setting is a dramatic demonstration. Visitors at our plant can see this done every day. There is no necessity for tinkering with the knife adjustment.

Demonstrates The Sound Engineering Design of

NIAGARA

POWER SQUARING SHEARS

● There is no compromise with sound, proven engineering when it comes to NIAGARA shear design and construction.

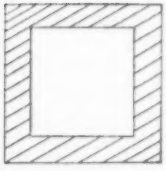
Accurate cutting depends primarily on rigidity of the shear's components.

For bed, crosshead and holddown NIAGARA uses CLOSED BOX SECTIONS to resist with minimum deflection the horizontal, vertical and diagonal or torsional loads to which every shear is subjected.

NO OTHER SECTION WILL DO THIS JOB AS EFFICIENTLY.

Angle or channel shaped sections have long since been abandoned for use on NIAGARA Power Shears.

The economy of quality is remembered long after price is forgotten.



BED, CROSSHEAD & HOLDDOWN DESIGN

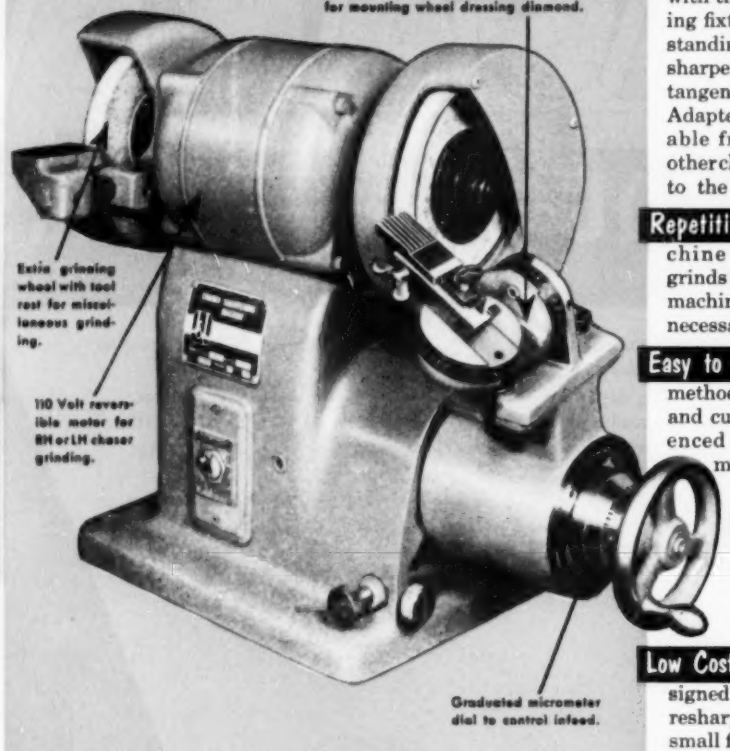
NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, NEW YORK

DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK

NEW

JONES & LAMSON UNIVERSAL BENCH TYPE CHASER SHARPENING MACHINE

Specifically designed to resharpen chasers, this *Low Cost,* space saving machine allows you to free heavy expensive machine tools for their intended uses, and at the same time do a better job of chaser sharpening. *It's good for miscellaneous small tool and cutter grinding too.*


J & L Universal Grinding Fixture with tangent chaser. Basic fixture has provision for mounting wheel dressing diamond.
Extra grinding wheel with tool rest for miscellaneous grinding.
110 Volt reversible motor for RH or LH chaser grinding.
Graduated micrometer dial to control infeed.

Grinder set up to resharpen J & L Tangent chasers

Universal Application Equipped with the new J & L chaser grinding fixture and adapters, an outstanding job will be done on all sharpening operations, for both tangent and radial die chasers. Adapters for J & L chasers available from stock. Adapters for other chasers can easily be applied to the chaser grinding fixture.

Repetitive Accuracy This machine will duplicate desired grinds repeatedly. It is a precision machine tool equipped with all necessary stops and controls.

Easy to Operate Simple, direct methods speed up the operation and cut costs. Even an inexperienced operator can, in a few minutes, learn to resharpen chasers on this machine.

Saves Space BENCH SPACE 14 x 28 inches is ample for your complete chaser resharpening operation.

Low Cost This complete unit, designed to do your entire chaser resharpening job, sells for only a small fraction of the cost of other bulkier machines often used. Why not install one in your plant, and release your heavier, bulkier machines for their intended uses?

Because of its size this machine can well be a time saver in shops where cutter grinding rooms are at distant points from the machines where dies are used. Write Dept. 710G for further details.

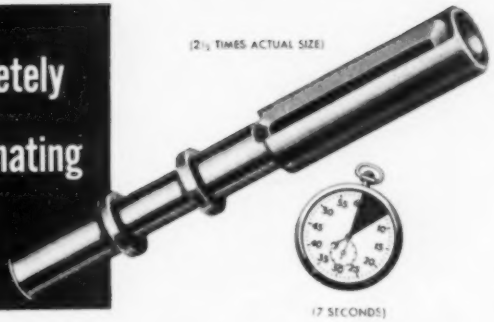
JONES & LAMSON

Machine Tool Craftsmen Since 1835

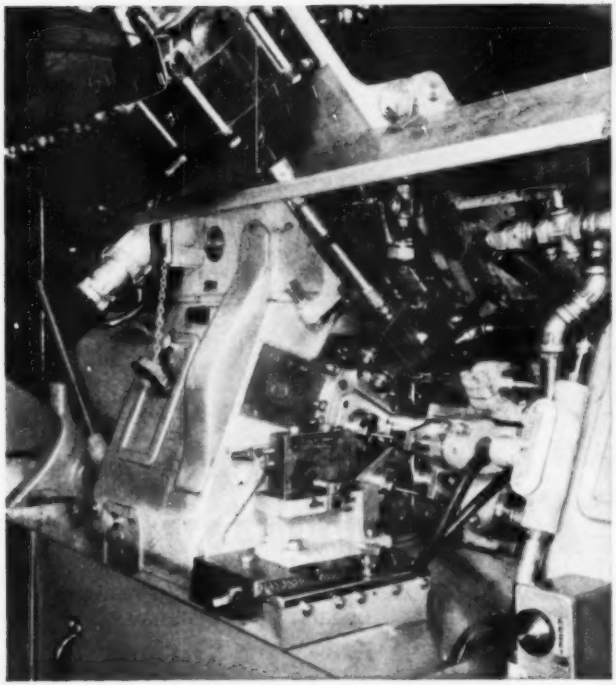
JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. Dept. 710

J&L DIE HEAD DIVISION

This copper alloy part completely machined in 7 seconds – eliminating 3 secondary operations



ACME-GRIDLEY BAR AUTOMATIC PERFORMANCE PLUS



Blanking, slotting the radius and back drilling are included in the twelve operations done by the Acme-Gridley *in 7 seconds*. Any one of these, done as a second operation, would take an equal amount of time.

Think of the savings in handling time, in machining time, in man-hours. And remember, these second operations can not be handled in one set-up unless the machine provides the wide, open tooling zones required for independent-power-driven auxiliaries—a feature of Acme-Gridley design.

This is no stunt job—it is typical of the savings thousands of users are making through Acme-Gridley tooling ingenuity. May we show how it can cut *your* costs?

JOB FACTS

PART—Socket post, $1\frac{7}{16}$" long x .188" diam.
MATERIAL—Copper Alloy
OPERATIONS—12, including slot radius, pick off and back drill, concentric with front drill
TIME—7 seconds, complete
MACHINE—Acme-Gridley RA-6 Spindle Bar Automatic

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 1, 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

Greater
Productivity
AUTOMATIC BAR AND CHUCKING MACHINES · PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING DRILLING AND MILLING MACHINES
NEW BRITAIN
Automatics
THE NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

IT'S HIS JOB TO HELP YOU SAVE TIME AND MONEY

Consistent top performance is only one of the advantages of using Card Taps. You also get a lot of practical know-how covering the range of tapping applications.

That's supplied by Card's staff of factory representatives — men whose extensive training and field experience qualify them to handle the toughest cutting tool problems.

Very likely a Card representative can come up with suggestions that will benefit your own production. He's always available for advice on any tapping operation, present or planned. S. W. CARD MANUFACTURING COMPANY, Mansfield, Massachusetts, DIVISION OF UNION TWIST DRILL CO.

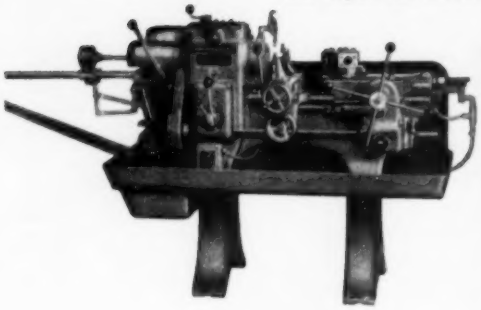
ASK YOUR CARD DISTRIBUTOR FOR COMPLETE DETAILS

The CARD Quality

TAPS

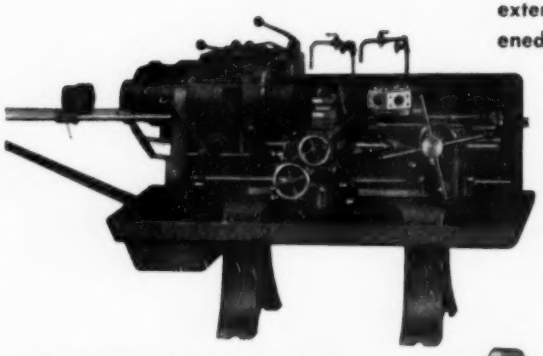
Also makers of DIES • SCREW PLATES • DIE STOCKS
TAP WRENCHES

No. 2 GEARED ELECTRIC TURRET LATHE
Bar capacities, standard work 1" x 7", Swing 13½"

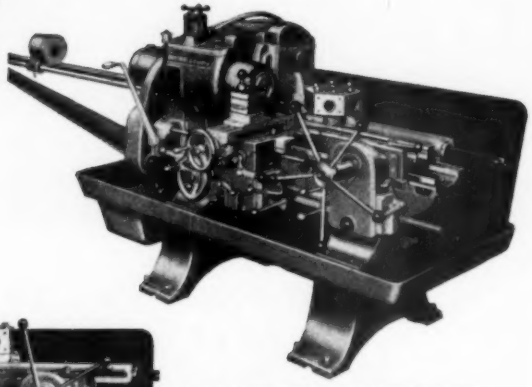


An Outstanding Line of RAM TYPE TURRET LATHES

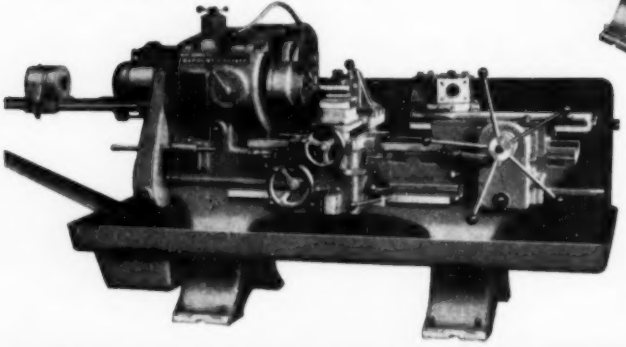
This comprehensive line of Ram Type Turret Lathes features outstanding ease of operation. The most extensive use of anti-friction bearings and hardened-ground alloy steel wearing surfaces combined with highest safety factor in power transmission and utmost rigidity of all tool supporting members lends long lived accuracy and great productive capacity. The exclusively Bardons & Oliver combination of pre-eminent features makes each size a leader in its own field.



No. 3 UNIVERSAL TURRET LATHE
Bar capacities, standard work 1½" x 9", light work 2" x 9". Swing 15⅛"



No. 7 UNIVERSAL TURRET LATHE
Bar capacities, heavy duty work 2½" x 14", standard duty work 3" x 14". Swing 21½"



No. 5 UNIVERSAL TURRET LATHE
Bar capacities, heavy duty work 2" x 12", standard duty work 2½" x 12". Swing 18"

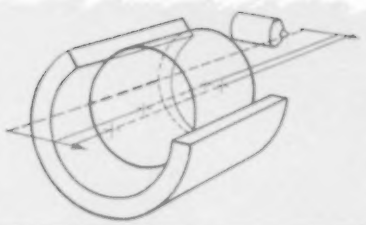
•

WE ALSO BUILD A COMPLETE LINE OF CUTOFF MACHINES

•

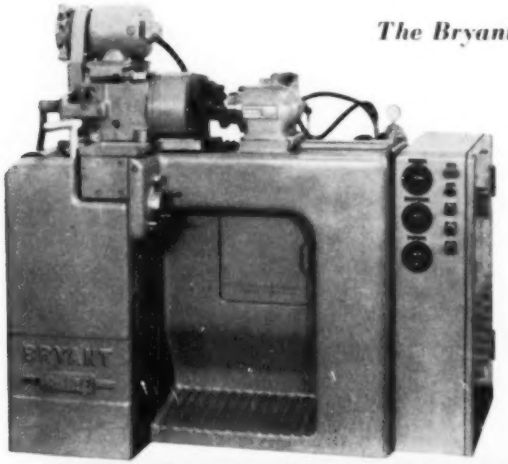
BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO



bryant
internal grinding

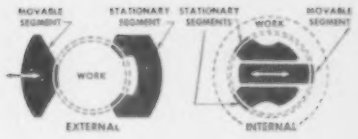
Accurate alignment of various machine elements is a basic consideration on even the simplest machine tool. Industry's demand for increased production and accuracy makes the alignment problem more critical than ever before. Bryant machines are designed so that they may be aligned, and this alignment may be maintained throughout the life of the grinder. Alignment and its effect on precision hole grinding is discussed on the preceding page.



The Bryant 1109 Precision Internal Grinder

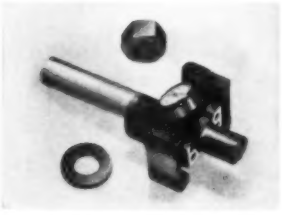
THIS semiautomatic machine is intended primarily for grinding bores under 1" diameter. It has chuck swing of 9" and maximum grinding stroke of $3\frac{1}{2}$". Sensitivity with rigidity are obtained by using preloaded ball slides for both cross and longitudinal movements, which transmit load directly to machine base. The Bryant Hi-Frequency Wheelhead is standard equipment, and provides speeds up to 100,000 R.P.M. for efficient surface speeds on small diameter work. Write for full information.

Bryant Chucking Grinder Co., Springfield, Vermont, U. S. A.



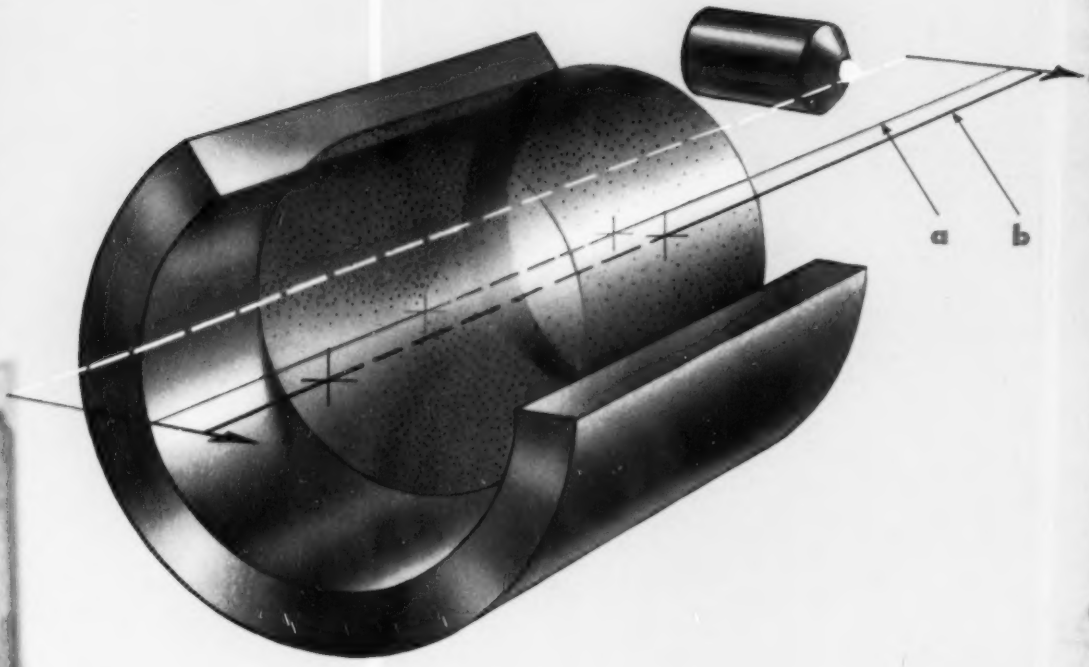
bryant
thread gaging

Bryant gages are built on the principle of an "expanding" master plug for checking internal parts, or a "contracting" master ring for checking external threads. A dial indicator gives a reading of P.D. which includes variation in thread form and lead. This is an accurate indication of assemblability.



The Bryant P-11 Portable Thread Gage

THIS is basically a split plug gage, equally effective for bench inspection or for gaging internal threads on parts still held in the machine, or in large work that is difficult to move to the inspection department. *4 to 5 times faster than plug gaging!* Standard range from 5/16" to 5" in diameter. Write for catalog describing full line of Bryant Thread Gages.



bryant
internal grinding

THE heart of the internal grinding process is the line of contact between the wheel and the work. This contact line must be straight for the full length of the wheel and the full length of work as the wheel traverses. If the contact is not a straight line, the internal grinder is "out of line". Improper alignment may show up in the work as incorrect hole geometry (bell-mouth or taper) and poor surface finish. In addition, excessive wheel wear and poor wheel action may result.

Several elements contribute to the straightness of this line of contact: first, the path along which the wheel is traversed "a" must be a straight line; second, the axis of the wheel must be parallel to the wheel path "a", and third, the axis of the work "b" must be parallel to the wheel path "a". For production grinding, the diamond must lie in the plane established by the wheel axis and the work axis.

Perfect alignment means that the slides must be straight and true, the wheel and work spindles must be in line and "zeroed" for center heights and the diamond must be on "dead center" of the wheel. A full, straight line of contact will extend wheel life, improve wheel action, and will assure correct geometry and required finish.

Bryant Chucking Grinder Co. Springfield, Vermont

MODERN PRECISION TOOLS

MODERN COLLAPSIBLE TAPS

Modern Self-Opening Die Heads are available in both stationary and rotary types. The stationary type is made in a range of sizes with capacity for cutting straight threads from 1/8" to 7", and 1/8" to 6" for pipe threads.

MODERN SELF-OPENING DIE HEADS

Of unusually simple design with a minimum number of parts and no complicated mechanisms, this new Modern Collapsible Tap Style A-A helps meet industry's demand for faster, lower cost production. It is made in a wide range of sizes with adequate capacities for cutting straight threads and straight and taper pipe threads. All parts are of properly hardened steel, ground and precision fitted.

Modern-Magic Quick Change Chuck and Collet Equipment virtually eliminates costly idle time usually present in revolving spindle operations. Tools are changed without stopping or even slowing the spindles. Modern-Magic Chucks are made in 6 sizes and two types: friction drive and positive drive. Modern-Magic Collets are available in a broad range of both standard and special types.

Modern Self-Opening Stud Setters are positive and entirely automatic in action, and can be operated in any position with either air or electrically driven portable tools. Also equally effective in drill presses where it is possible to drill and tap the holes and set the studs in successive operations. Made in two sizes 1/2" and 7/8" capacity.

Modern Medium Duty Face Milling Cutters are of blade backed design, and are made in axial and radial types. Standard Modern axial type cutters are available in diameters from 4" to 24". Standard radial type cutters from 8" to 24" diameters. All blades, wedges and screws are interchangeable in all Modern Cutters regardless of diameters.

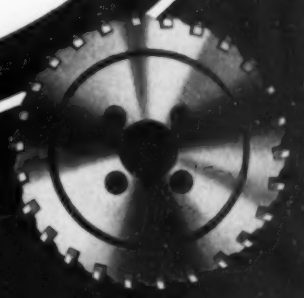
MODERN-MAGIC CHUCKS AND COLLET EQUIPMENT

Detailed information covering any Modern Precision Tool in which you are interested will be furnished promptly upon request. Let us show you how Modern Precision Tools can help to speed up your production and reduce your costs.

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

MODERN SELF-OPENING STUD SETTERS



MODERN FACE MILLING CUTTERS

Modern Precision Tools are produced by the originators of the Modern-Magic Quick Change Chuck and Collet Equipment.

MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

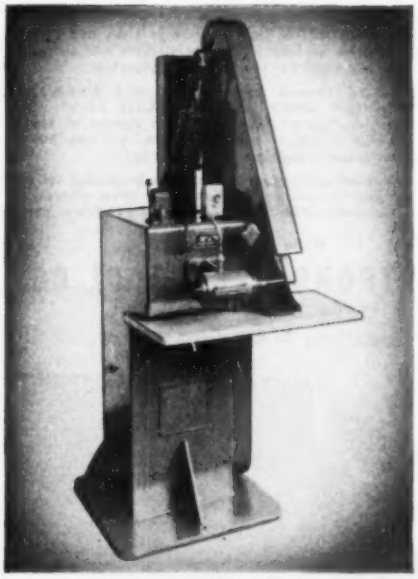
SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

Jet blade polishing with

Behr-Manning abrasive belts

points the way to big advances in all production contour polishing

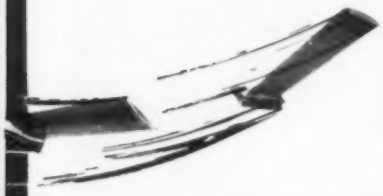


Off-hand machine uses belts as narrow as 5/8 inch, on a wheel small enough to do fillet areas. Manufactured by Vonnegut Corporation.

■ **Behr-Manning abrasive belts are helping to clear up a bottleneck in jet engine production, in the polishing of blades and buckets.**

A number of methods have been developed — both manual and automatic — for the speedy handling of this critical polishing operation. It is significant that practically all methods utilize the production advantages of Behr-Manning abrasive belts.

Several of the various ingenious methods already in use for this special contour belt polishing job are illustrated here. It is more than likely that some if not all of the new equipment may be adaptable to many other forms of contour polishing, and thus open an entirely new production field in contour work. BEHR-MANNING Field Engineers are well abreast of these new developments and will be glad to discuss them as applied to your work.



FOR IMMEDIATE INFORMATION

Read "Coated Abrasives Ease Jet Blade Finishing Problems" from the June issue of "Steel." The reprint will be mailed at your request. Write Behr-Manning Corp., Troy, N. Y., Dept. AM-9.

For export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A., and in Canada, Behr-Manning (Canada) Limited, Brantford.

BEHR-MANNING

ARMSTRONG
TOOL HOLDERS...
for every operation!

There are **ARMSTRONG** Tool Holders in sizes and types for every operation on lathes, planers, slotters and shapers —for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of **ARMSTRONG HIGH SPEED, ARMALOY** (Cast Alloy) and **ARMIDE** (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

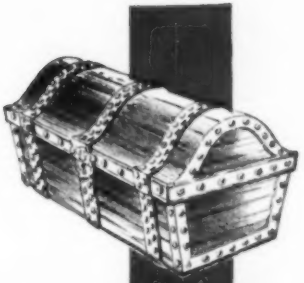
5215 W. Armstrong Ave. Chicago 30, Ill.

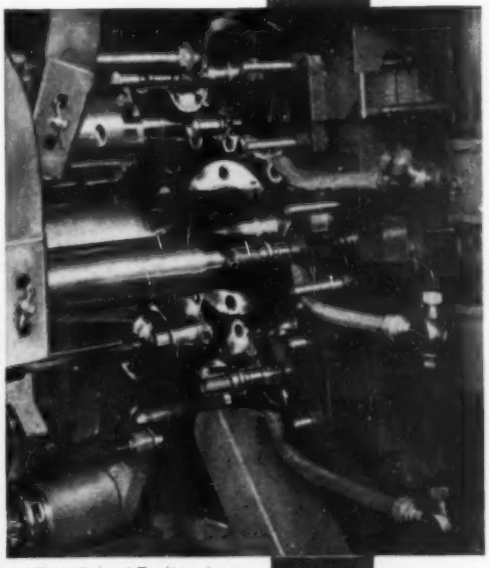
PIECES FROM EIGHTS

The first eight spindle bar automatics were introduced in 1930 by the late Frank L. Cone, founder of the Cone Company.

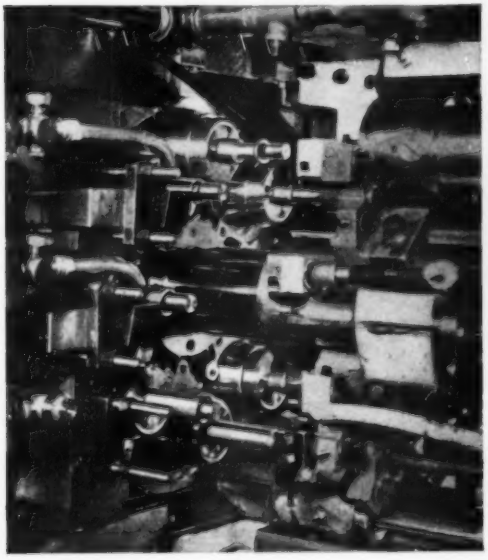
CONOMATIC Eights have had the usual opportunities available to any production tools that can handle added requirements and responsibilities.

With more tool positions than other "automatics", Eight Spindle CONOMATICS have an advantage in taking on, at one chucking, operations that save the costs of second handling.





Rear Side of Tooling Area



Front Side of Tooling Area

The milling and stamping operations performed by the 1⅝-EIGHT, on the piece shown, did not require stopping the spindle. The dependable performance of CONOMATICS makes such money-saving operations well worthwhile.

A Comparison of ALL Automatics is in favor of Cone

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

WHAT *Life-Lines* REALLY DELIVER IS MORE SERVICE...LESS SERVICING

See the space you save with these modern *Life-Lines*

Both Life-Line motor and Life-Linestarter are space stretchers. The reason? Compactness. They are smaller, lighter than most conventional types . . . can be installed in close quarters where others can't be accommodated.

Notice that the motor has no grease cups or fittings. It's pre-lubricated . . . needs no further lubrication. This means you can cramp it into close quarters, forget greasing channels and nipples brought to outside of machine. Just install it in "hard-to-get-at" locations and forget it! The way to grease a modern motor is *don't*.

A check of the Life-Linestarter will show you all parts can be removed straight from the front. No need to allow extra work room for servicing. Further, wiring is straight through. You get simplified wiring, shorter leads. And you can have two electrical interlocks without increasing starter width. This means, smaller cavities and more compact cabinets.

These features give you the most advanced designed equipment available today. Built to match the modern advancements you build into your equipment. But get complete data. Ask your Westinghouse representative for latest information, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21692

YOU CAN BE SURE...IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

Lengthens Die Life 100%

STEPS UP PRODUCTION

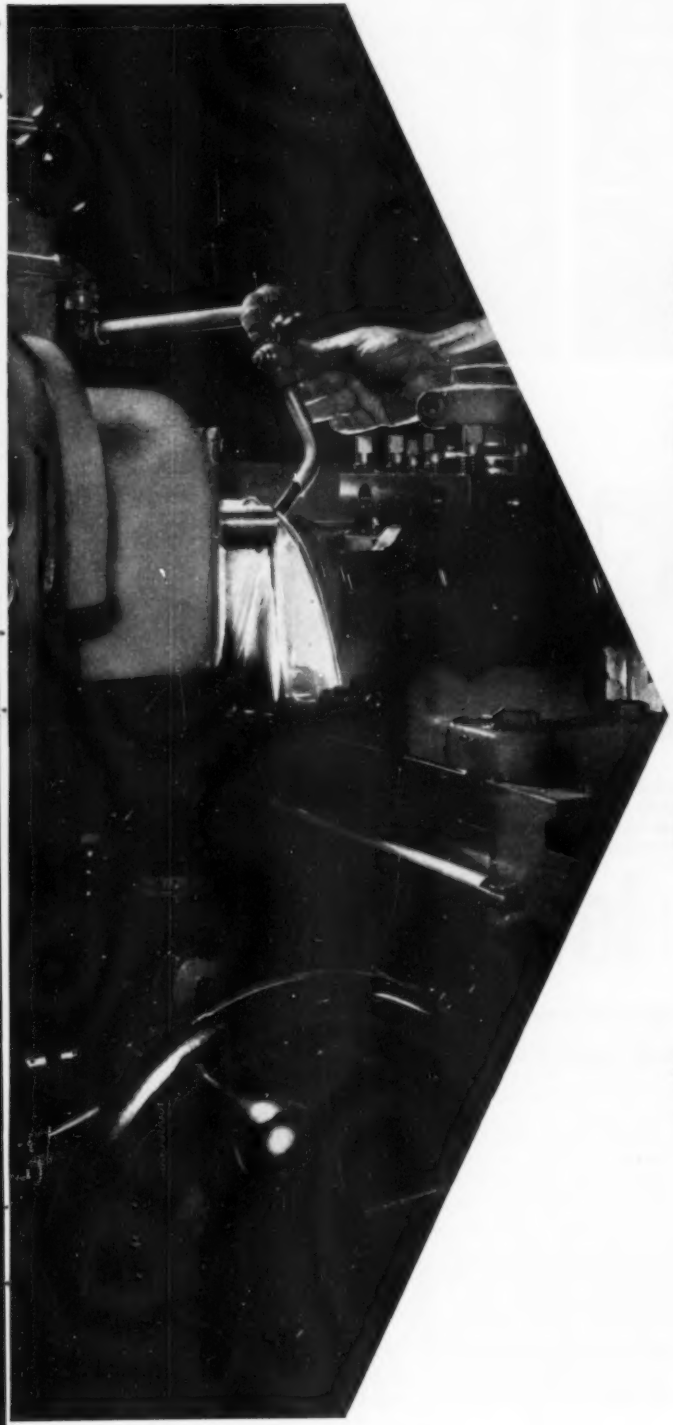
● The Tool Room of the Rock Falls, Ill., plant of Russel-Burdsall & Ward Bolt and Nut Company had a problem.

Here, dies, made of very tough, high-carbon, high-chrome steel, are bored and reamed for the Heading and Trimming Dept. machines. In this work, the Tool Room was getting a very poor finish, which resulted in short die life. Finally, one year ago, the foreman tried a special Sinclair cutting oil . . .

Results since have been remarkable. The Tool Room states that the dies are now near-perfect, that the necessity for any further finishing operation has been eliminated, and that die life has been increased – conservatively – 100%.

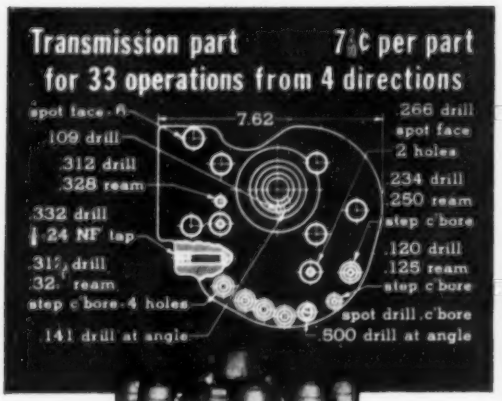
In addition, since the dies now last far longer, there's less downtime for changing dies. Therefore, production of bolts and nuts in this huge plant has been stepped up appreciably.

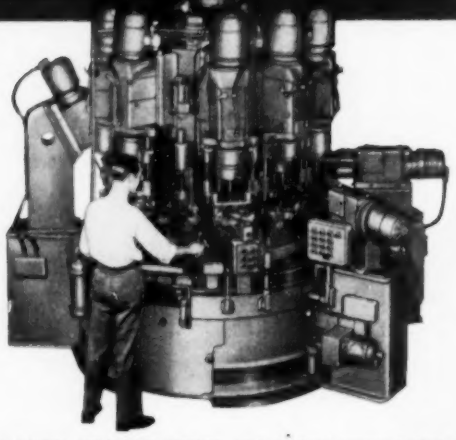
This is typical of the way the specialized Sinclair Cutting Oils and Coolants are solving machining problems. Perhaps they can help you, too.
Phone or write the nearest Sinclair Representative or write
Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.



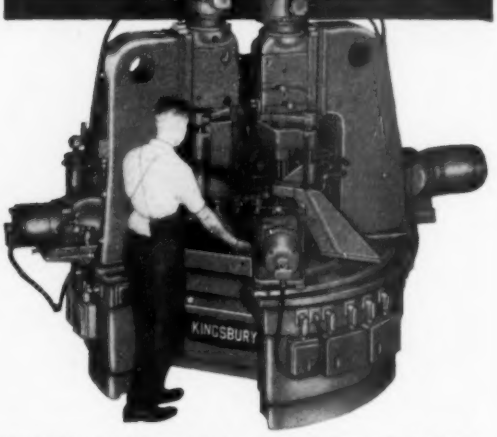
SINCLAIR CUTTING OILS and COOLANTS

for metal working





185 PARTS AN HOUR GROSS. This 60-inch power indexing machine has 12 stations. Eight vertical units mounted on the central column operate 28 tools. Two angular units drill .141 and .500. Two horizontal units drill .109 and .332 and tap ⅜-24.



970 PARTS AN HOUR GROSS. Twelve fixtures on a 20-inch power index table rotate 120° with each index. Four horizontal units drill and tap the peripheral holes. Three vertical units do the ten axial holes. Clamping and unclamping are automatic.

Amazingly low unit costs

Any way you figure it, Kingsbury machines save money on accurate high-production drilling and tapping operations

Dear Sir:

Here is the average cost of the man and machine for each *operation* shown in the drawings:

Transmission part	22/100¢
Telephone part	3/100¢
Generator part	7/100¢
Typewriter part	10/100¢

One reason these costs look good is that they include just the man and machine — no power or overhead. But there is no tricky figuring. In fact, we think the basis is quite conservative. We assumed:

1) 80% efficiency;

2) a wage rate equal to today's national average;

3) a pay-off period of 6000 hours of production — about a year with three shifts or three years with one shift, a fraction of the useful life.

The unit cost on each drawing is the sum of these two figures —

The unit cost of the man:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% efficiency}}$$

The unit cost of the machine:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hours @ 80\% efficiency}}$$

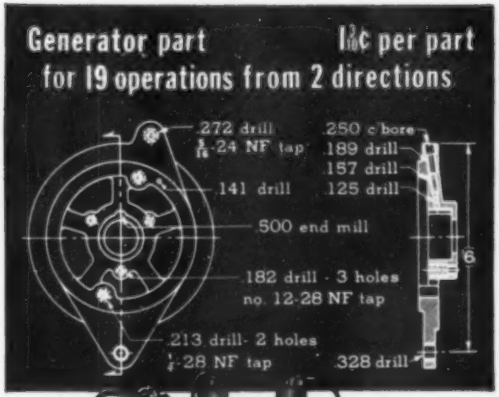
You can use actual figures

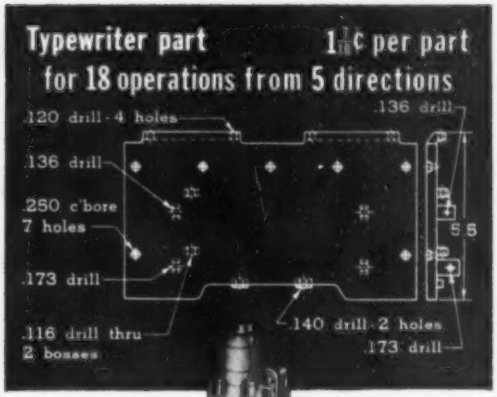
We hold no brief for our assumptions, but we had to assume *something*. The pay-off period is 6000 hours because most Kingsburys do pay for themselves in one to three years.

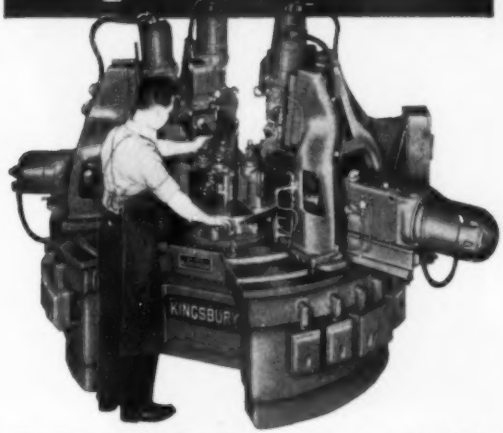
If you want to know if a Kingsbury would be a good investment for you, ask us for a proposal. Then figure your unit costs in your own way using your own figures. Even a rough calculation may convince you.

Meeting close tolerances

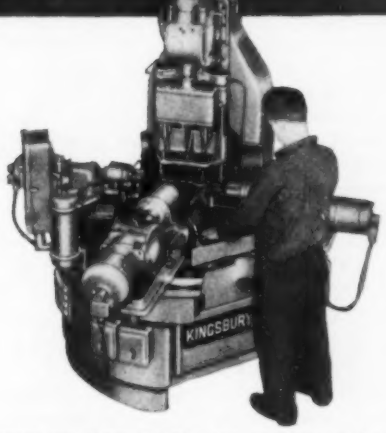
Savings alone don't sell Kingsburys. Other high production machines may match our costs. But how about the quality of the finished parts? In all







430 PARTS AN HOUR GROSS. A 20-inch power index table has five fixtures. At the four working stations four horizontal units do the holes in the left view and four units on tunnel columns do the oil hole. Three units have multi-spindle heads.



280 PARTS AN HOUR GROSS. Put one piece in the fixture and trip a lever. The vertical unit clamps it and counterbores seven holes. Then horizontal units operate on four sides. When the clamp withdraws, remove the piece. There is no indexing.

on 4 high production jobs

humility we feel that in this type of work no equipment excels ours. That is just our opinion, of course, but it is an honest one.

Bushings guide drills and reamers accurately. We locate spindles to exact indicator readings and run them in precision ball bearings.

Each index table and its fixtures are jig-bored to minimum tool room tolerances. Each fixture is rugged and grips the part firmly without distortion. The locating points conform to your specifications.

We're not in the back woods

Some people who visit us for the first time are surprised at the quality of our equipment and our work. Maybe they just don't expect much from people in the New Hampshire hills. Actually we are right between the machine tool centers of Worcester, Mass. and Springfield, Vt.

Our shop has three acres of floor space, 122 machines under ten years old and employs 316 people with a combined length of service of 3257 years. We have 11 jig-borers and nine boring machines, mostly in a windowless air-conditioned building with strict control of temperature and humidity.

If you are ever up in these parts and have high production drilling and tapping problems, we hope you will stop in and see us. We make a lot of friends that way.

Sincerely,
Kingsbury Machine Tool Corp.
95 Laurel St., Keene, N. H.

KINGSBURY

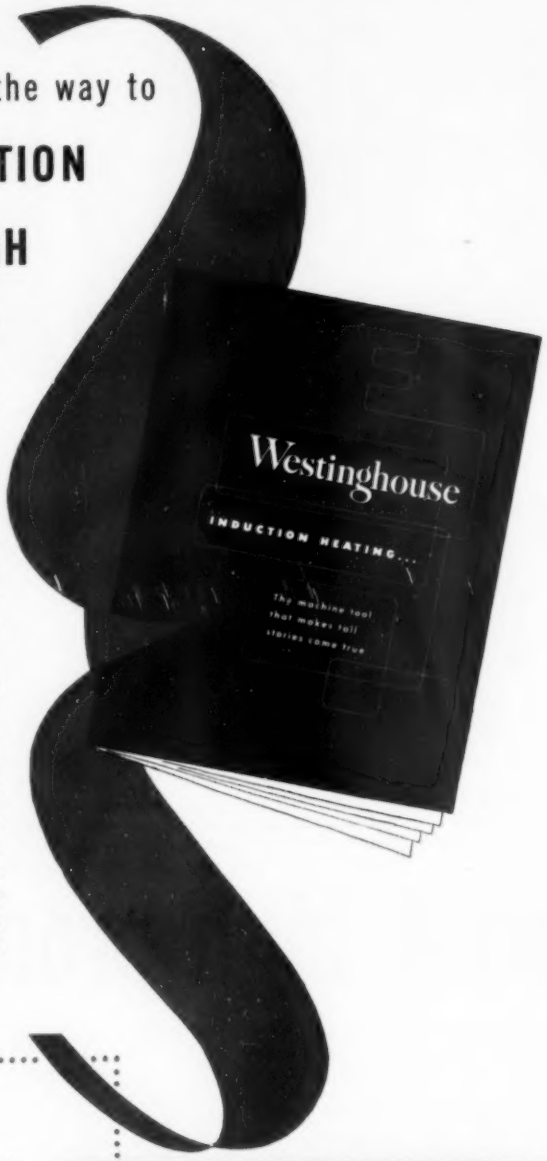
AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

Let this booklet show you the way to

INCREASED PRODUCTION EFFICIENCY THROUGH INDUCTION HEATING

Westinghouse has prepared a Case History Booklet showing a few of the Induction Heating applications presently being used by some of America's largest manufacturers. It's one amazing record after another of what Induction Heating can do . . . backed up by product, production and cost comparison figures. Some cases may remind you of situations in your plant. Others may suggest application possibilities not yet tried. But all the stories will give you a good idea of the ever-increasing scope of Induction Heating.

Already, thousands of different parts are being hardened, annealed or joined by Induction Heating. But there are thousands more that could be . . . and should be heat treated by this method. *Because in virtually every case where Induction Heating has been put to work, the user has gotten increased production efficiency . . . at lower operating cost!* But see for yourself what this outstanding tool can do. Just clip the coupon for your free copy of this informative booklet — or drop us a line with your request to Westinghouse Electric Corporation, Dept. M-38, 2519 Wilkens Avenue, Baltimore 3, Maryland.



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Electronics & X-ray Division, Dept. M-38
2519 Wilkens Avenue
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Please send me a copy of the detailed Westinghouse Induction Heating Case History Booklet.

Name _____ Title _____

Company _____

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YOU CAN BE SURE...IF IT'S

Westinghouse

INDUCTION HEATING

CLEEREMAN DRILLING MACHINES

LOWEST Operating Costs!

Why?

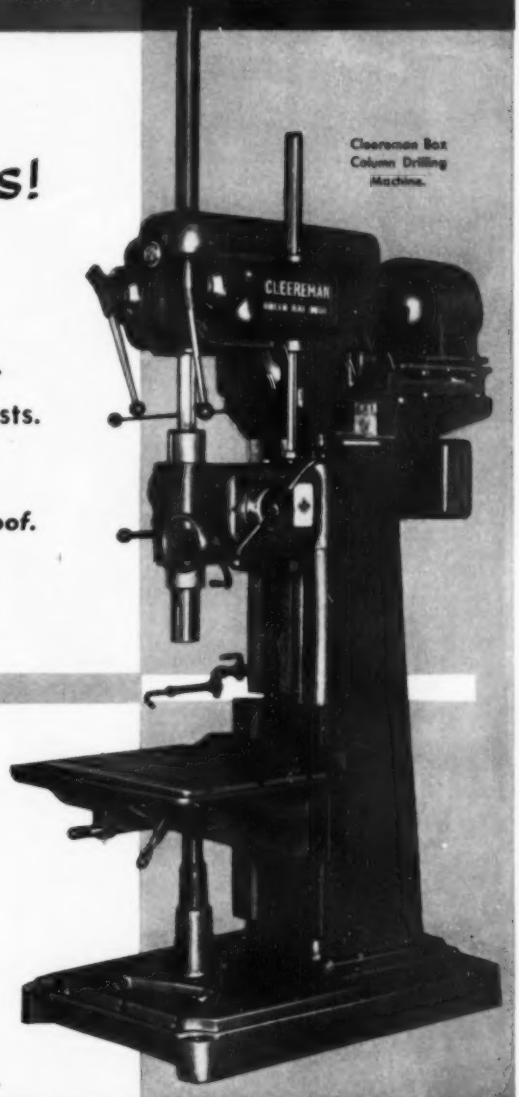
1—Eliminate Down Time.

2—More Power to Produce.

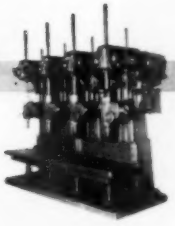
3—Lowest Maintenance Costs.

4—Less Operator Fatigue.

Go to any Cleereman user for proof.



Cleereman Box Column Drilling Machine.



Cleereman Multiple Drilling Machine.

Cleereman Round Column Drilling Machine.

BRYANT Machinery & Engineering Company

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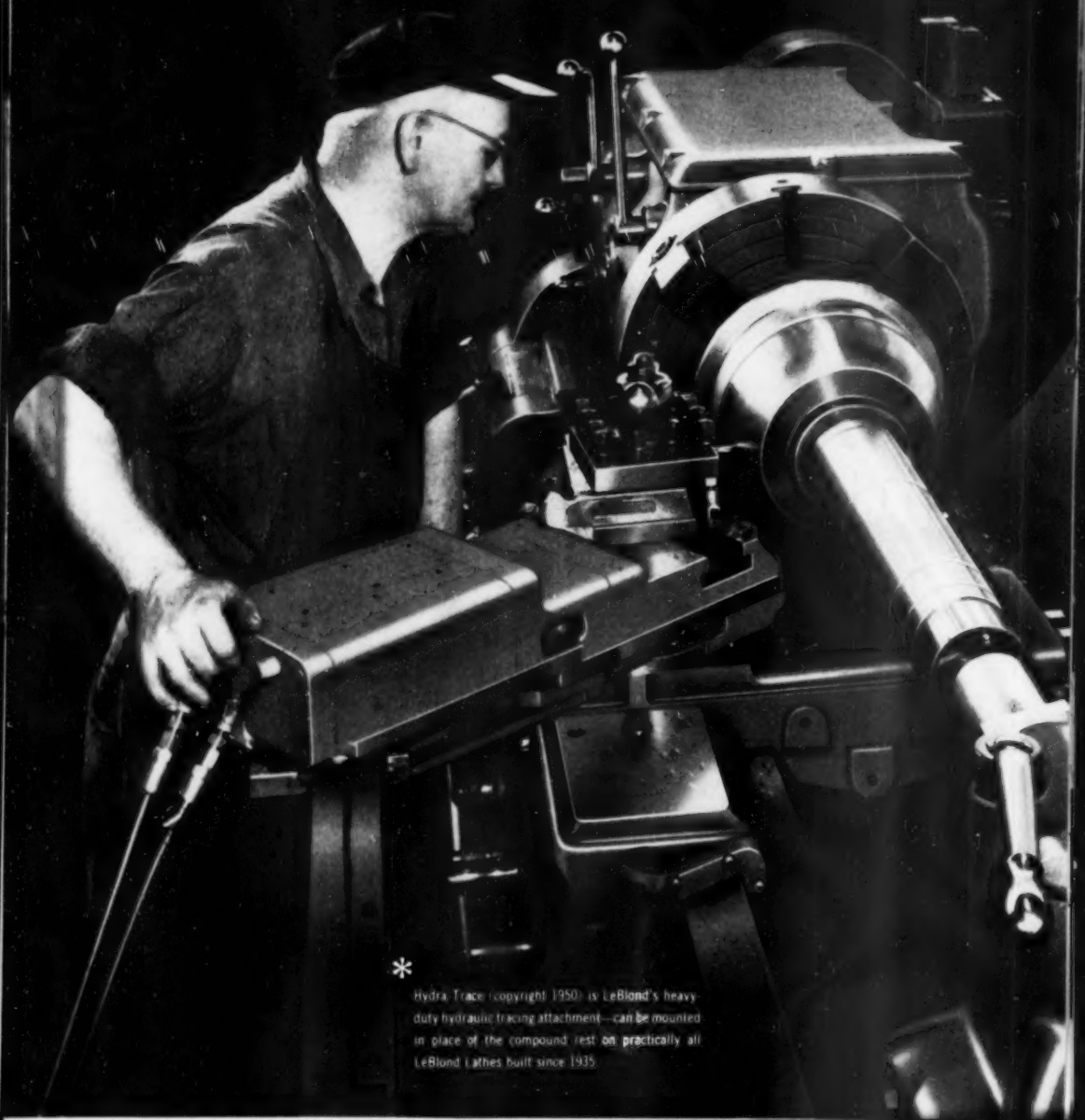
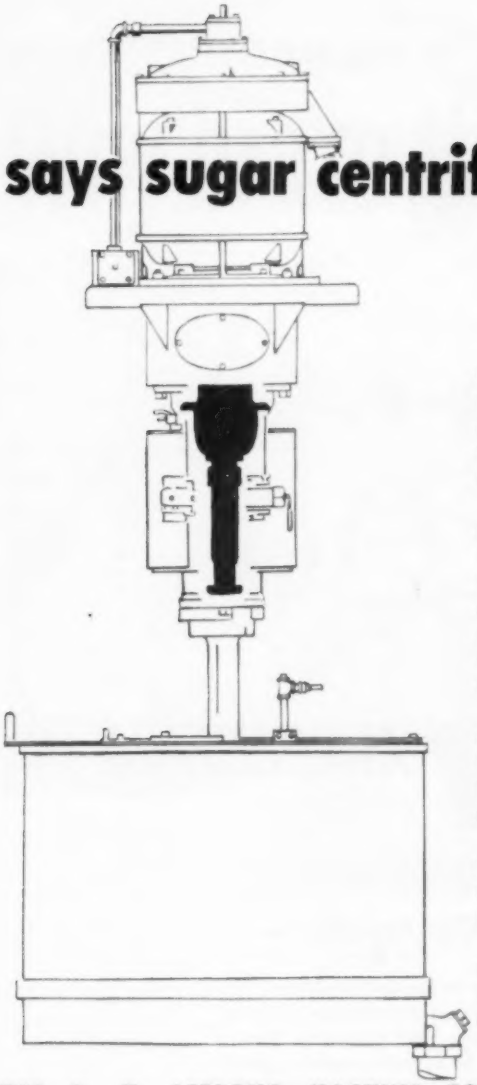
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

"sweet is the name for HYDRA-TRACE"*



* Hydra-Trace (copyright 1950) is LeBlond's heavy-duty hydraulic tracing attachment—can be mounted in place of the compound rest on practically all LeBlond Lathes built since 1935



says sugar centrifugal manufacturer

turning time cut 60% on contoured 3-step shaft

Centrifugal machines made by The Western States Machine Co. of Hamilton, Ohio are used in all corners of the world for the processing of sugar. Three years ago, this company had to speed up machining methods.

One important part, a contoured 3-step shaft—called a "ball and quill"—carries the thrust of the basket as it spins at 1800 rpm. The ball allows the basket to shift slightly, compensating for unbalanced loads. This part was first produced in the usual manner, which included turning the contour with a radius attachment, followed by tedious file finishing.

Then, on the recommendation of LeBlond's Cincinnati Distributor, E. A. Kinsey Co., a Hydra-Trace unit was installed on a 16" LeBlond Heavy Duty Lathe. The result was "sweet"—turning time cut 60%!

Sweet, too, were the other benefits of Hydra-Trace. No need for highly-skilled operators. Flat templates, made quickly, stored easily. Short set-up time. Heavy-duty capacity. Many more.

See how you can reduce to hours and minutes tracing jobs formerly measured in weeks and days. Ask your distributor or write us direct for the rest of the story on Hydra-Trace.

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for bulletin HT2A for complete details on LeBlond Hydra-Trace

turned faster by

LEBLOND of Cincinnati

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

SONOFLUX MAGNETIC PARTICLE INSPECTION

prevents costly breakdowns —
cuts finished parts rejects —

The dual purpose SONOFLUX Inspection Instrument earns its keep both as a production *and* as a maintenance inspection tool. Spotting cracks and flaws before finish machining. Keeping machines and equipment running by periodic magnetic particle inspection of critical parts. This portable, lightweight unit, which can go anywhere in your plant, is an accurate and dependable inspection instrument.

Write for the complete story on the Model 3 Sonoflux Vibro-Magnetic Inspection Instrument or request a demonstration at your plant.

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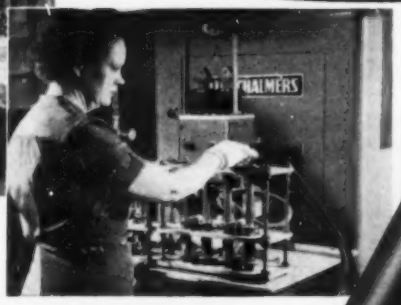
WHEN YOU CAN DO IT THIS FAST AND CHEAP—

Why braze the slow ways?

NORTHWESTERN CORP., MORRIS, ILL.
brazes 440 tubes per hour
for only 1/10¢ per joint



IN FIRST STEP, rotating brush applies flux at two places to be brazed. Next girl adds silver rings and places end piece on tube. Girl at right then places four tube assemblies in one of two work fixtures of 20-kw Allis-Chalmers Induction Heater — while four other tubes are being heated in adjacent fixture. Only 28-second heating cycle required.

TWO STATION fixture permits loading one station while four other tubes are being heated, so that duty cycle of almost 100 percent is maintained. Reject rate is low; scaling is minimized. Cost of operating induction heater is about $0.90 per hour. You can get an idea of cost in your plant by adding your burden and rate for unskilled labor.

EXPERT ENGINEERING HELP

Whether your problem is brazing or soldering, hardening or annealing, find out what an Allis-Chalmers Induction Heater can do for you. Standard ratings up to 100-kw output are available. Call your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS
Milwaukee 1, Wis.

☐ Send Induction Heater Booklet 15B6430A

☐ Send print of 16 mm color-sound film "Induction Heating, Industry's Modern Tool."

Name _____

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Company _____

Street _____

City _____ State _____

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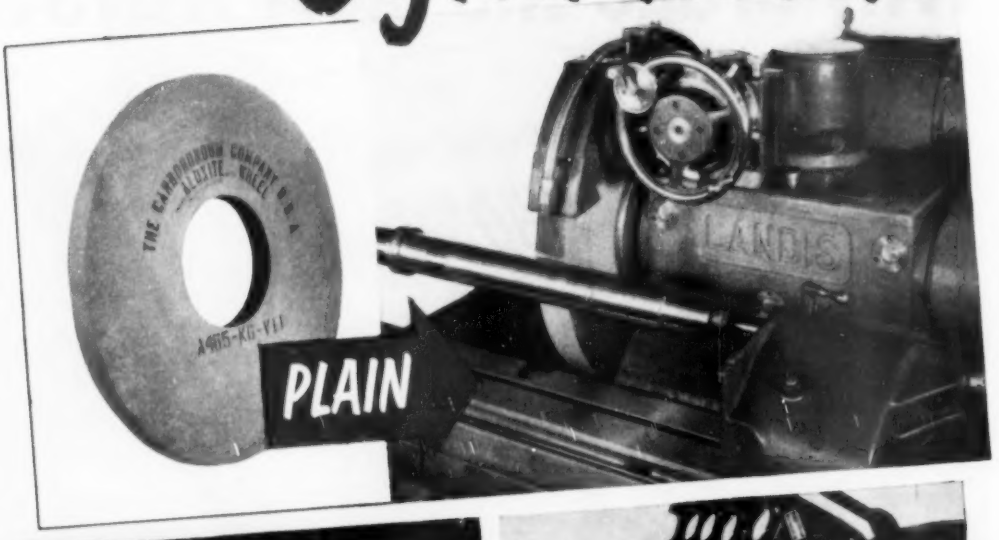
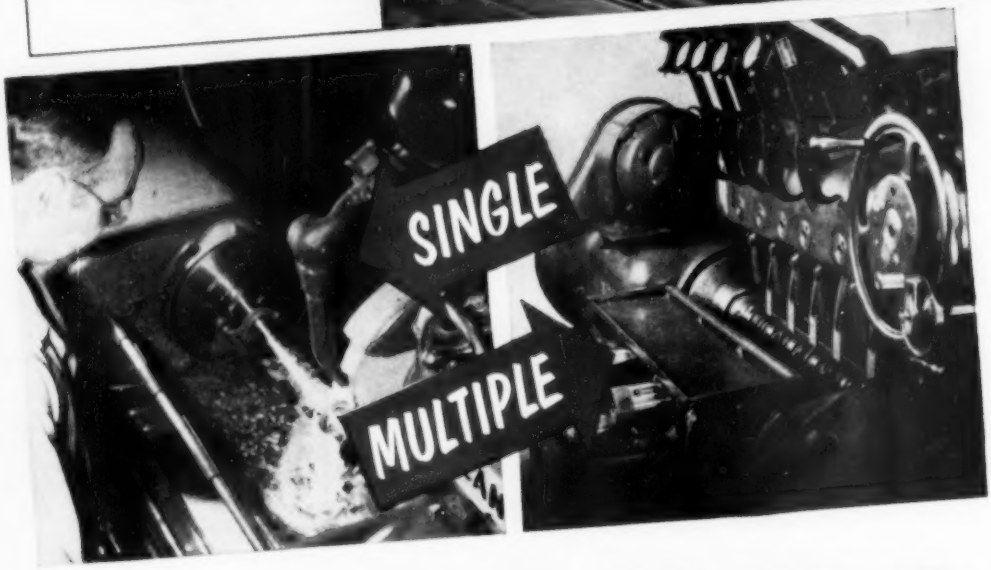
ALLIS-CHALMERS

Cylindrical





Only CARBO

TRADE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York

Grinding...

Cylindrical Grinding Wheels by CARBORUNDUM give you the right combination of aluminum oxide grain and vitrified bond—the combination that, on *your* specific job, spells highest output at lowest cost.

ABRASIVE GRADES

ALOXITE "A"—a more friable type of regular aluminum oxide grain for roughing and finishing on soft to medium hard stock.

ALOXITE "AA"—chemically pure type of aluminum oxide grain, extremely friable and thus ideal for grinding heat-sensitive, hard alloy steels.

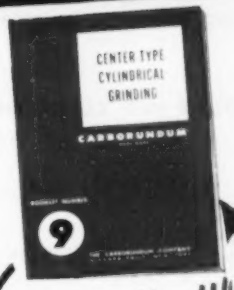
ALOXITE "DA"—blend of "A" and "AA" grain types. Cuts cool and fast on the harder heat treated steels.

VITRIFIED BONDS

"V10"—cool cutting, yet tough...the standard structure is superior on form grinding work and wherever finish is more important than stock removal.

"V11"—for moderate to heavy stock removal. Very cool cutting, with a more open structure that promotes high cutting rates. Holds corners well. Widely preferred on crankshaft work.

"V12"—a very open structure uniquely successful on large crankshafts. Generates a precision finish, free from burns, on difficult work involving large areas of contact, high sidewalls and large pin diameters.



This "tell-all" booklet is FREE!

Write Dept. AM 81-83 for your copy

And for cylindrical grinding of low tensile materials, CARBORUNDUM silicon carbide wheels, in two types of abrasive grain and two types of vitrified bond, deliver the same high-output, low-cost production on cast iron, aluminum, brass, etc.

ORDER FROM YOUR CARBORUNDUM DISTRIBUTOR TODAY. He's your best bet for complete stocks, prompt delivery, experienced counsel on latest developments in the field. You'll find him listed in the yellow pages under "Abrasives." Phone him today—it's to your profit!

RUNDUM

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offers ALL abrasive products...to give you the proper ONE

Ask Yourself:

1 ***Do we have hand operations that could be mechanized?***

2 ***Is inferior mechanization hampering any operation?***

3 ***Can we use a greater degree of automatic control?***

4 ***Could we combine several operations into a continuous process?***

If your answer is yes, then you are not producing as fast and efficiently as you can

. . . and the immediate importance of your answer is this: from now on, your success as a manufacturer will depend more and more upon the degree of mechanization in your plant.

Too often, today, advances in mechanization are confined to breaking a production bottleneck, or matching a competitive process.

Let's look a bit further—at replacing these sporadic improvements with a *planned* mechanization program.

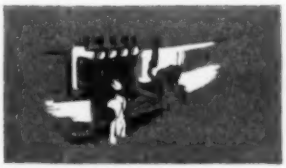
The results are cumulative. Progressively, each operation is lifted to a higher level of mechanization on a sound economic schedule.

You are insured against tomorrow's competition. Manpower and scarce materials are conserved. Your profit position is strengthened.

To help you plan your mechanization, General Electric offers a new guide. We call it "Progressive Mechanization." It's a "More Power to America" program—another way to increase industrial productivity by spreading the knowledge of modern industrial techniques.

HERE ARE THE FOUR STAGES OF PROGRESSIVE MECHANIZATION

1 Simple Mechanization—simple machines driven by power—like this electric tool.

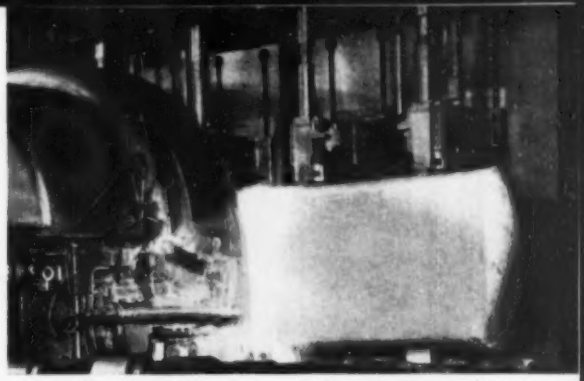


2 Improved Mechanization—more complex, like this drilling machine. Motors and controls aid manual operations.

3 Automatic Control—machines that have adjustable-speed with "push-button control," like an automatic welder.

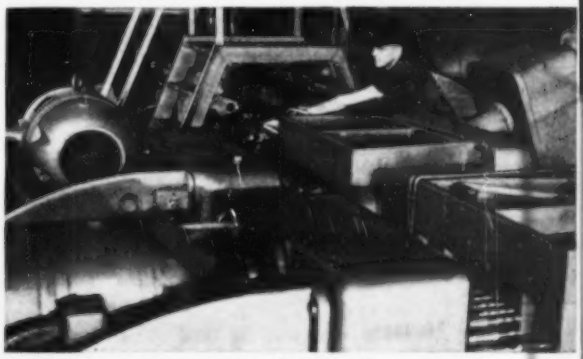
4 Continuous Process—machines co-ordinated for "start-to-finish" production.

Simple mechanization—example: Lightweight electric impact tool tightens nuts in 1/10 the time a hand wrench takes.



Improved mechanization—example: Special milling machine replaces lighter type—"scalps" aluminum billets 5' wide 10' long.

Automatic control—example: Adjustable-speed beer-can filling machine will change rate of production to meet any condition.



Continuous process—example: 216 operations are made on cylinder block in 36 seconds by automatic-transfer-type machine.

How you can improve production in your plant with the G-E Progressive Mechanization Program

START OFF with a "launching ceremony"—have all of your engineers and key people see the full-color movie "Motors in Industry." You'll drive home to them the importance of improving mechanization in your plant.

This informative film has more than 40 interesting mechanization case histories. Shots from four of them are pictured above. They are just a few of the examples that you can use to stimulate interest in mechanizing *progressively*.

CHANNEL THIS INTEREST—do some practical, organized probing into your present production methods. General Electric's Progressive Mechanization manual may help show you the way. Hand out the special mechanization survey forms. You can use them to enlist the participation of as many persons as you wish, including the men "at the bench."

WANT TO LEARN MORE? You get a free copy of the Progressive Mechanization manual, and indicate interest in seeing "Motors in Industry," just by sending in the coupon below. Or contact your nearest G-E Apparatus Sales Office.

GENERAL ELECTRIC

Back up your Mechanization Program with the G-E Motor Selection Course

Here's a complete course, covering the fundamentals of motors now available. It explains how to select and supply motors, what sort of control to use. Your local G-E representative can make arrangements for you to use this course.

MORE POWER TO AMERICA programs are guides to increase the efficiency of American Industry. They stimulate wider, more efficient use of electricity in production.

Section A752-14
General Electric Co., Schenectady 5, N. Y.

I'd like to learn more about the new G-E Progressive Mechanization program.
I'm interested in:

- ☐ **A free copy of the Progressive Mechanization manual.**
- ☐ **Seeing the motion picture on Progressive Mechanization.**
- ☐ **Using the "Motor Selection & Application Course."**

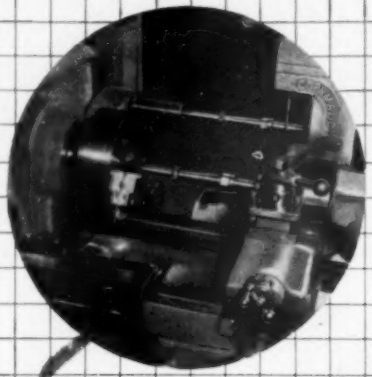
Name _____ **Title** _____

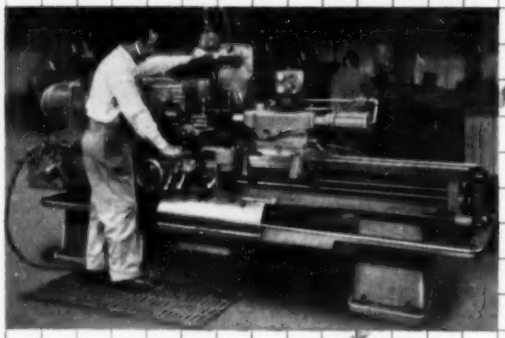
Company _____

Address _____

(Oil equipment manufacturer reports)

production increased at least 60%





with Lodge & Shipley copymatic

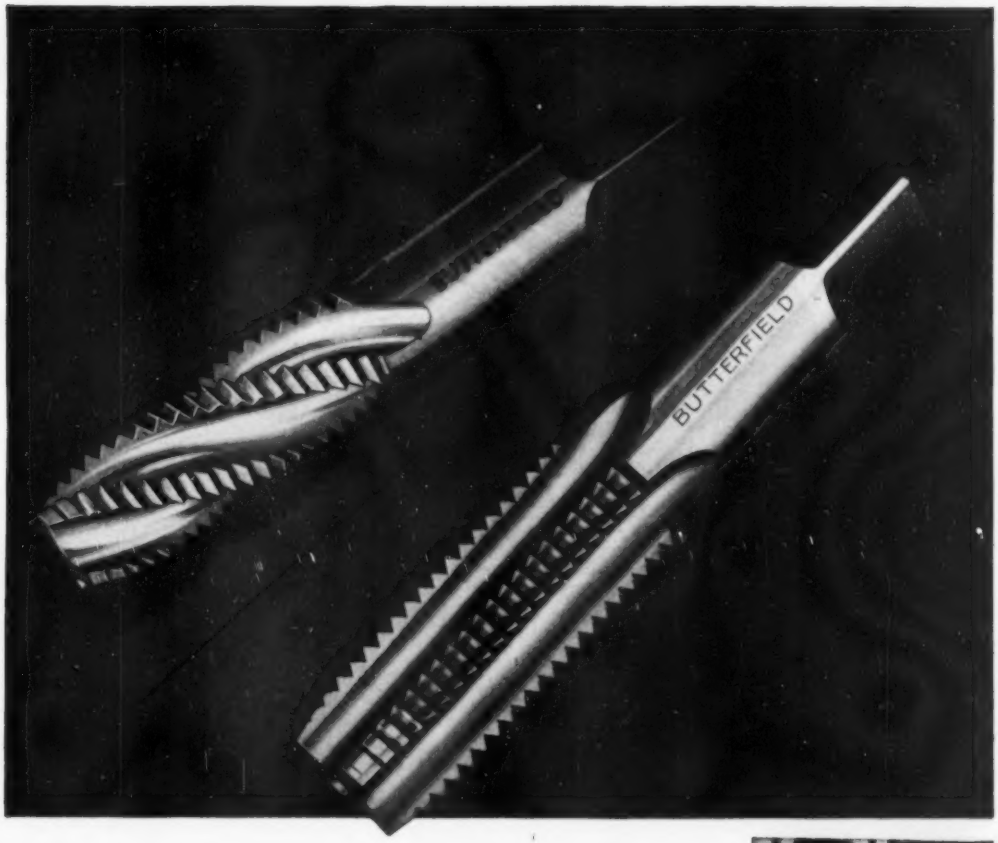
COPYMATIC form turning various oil well equipment items at Otis Engineering Corp., manufacturing affiliate of well-known Otis Pressure Control, Inc., Dallas, Texas.

In the production of sub-surface controls which must be placed and operate in oil well casings far underground, the precision and speed of the Lodge & Shipley COPYMATIC Lathe are valuable assets. This manufacturer says, "tolerances can be held closer . . . the COPYMATIC can be used as tracer type or conventional lathe . . . is very easy to operate."

On a typical job, 303 Stainless is turned for O.D. and taper at 549 RPM and .0067" feed, using Kennametal K3H tools. On this and other jobs involving form boring and threading, the user "has been very successful in decreasing production costs over the use of conventional lathes."

In any size shop . . . on a multitude of operations . . . the speed and versatility of the COPYMATIC, coupled with the accuracy of the Lodge & Shipley Model X Lathe, turns out more work at lower cost. For additional case histories, complete details, write:

THE Lodge & Shipley COMPANY
3059 Colerain Avenue
CINCINNATI 25, OHIO



THEY BRING ASSURED ACCURACY TO YOUR TAPPING JOBS

With Butterfield Taps you eliminate all risk of getting a defective tap that has been overlooked in ordinary factory spot-checking.

Each Butterfield Tap is individually inspected to make sure it will do a fast, clean, trouble-free job of threading.

That's why continued use of these 100% inspected tools is a long range policy that pays off in smoother, more economical production.

In the complete Butterfield line there's a tap for best results in every tapping application, in every material. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.

INSPECTOR checks thread form and lead on a Hartness Comparator that magnifies 62½ diameters. Part of Butterfield's 100% inspection.

Hand Taps • Machine Screw Taps • Pipe Taps
Stove Bolt Taps • Pulley Taps
Staybolt Taps • Boiler Taps • Nut Taps
Serial Taps • Mud or Washout Taps

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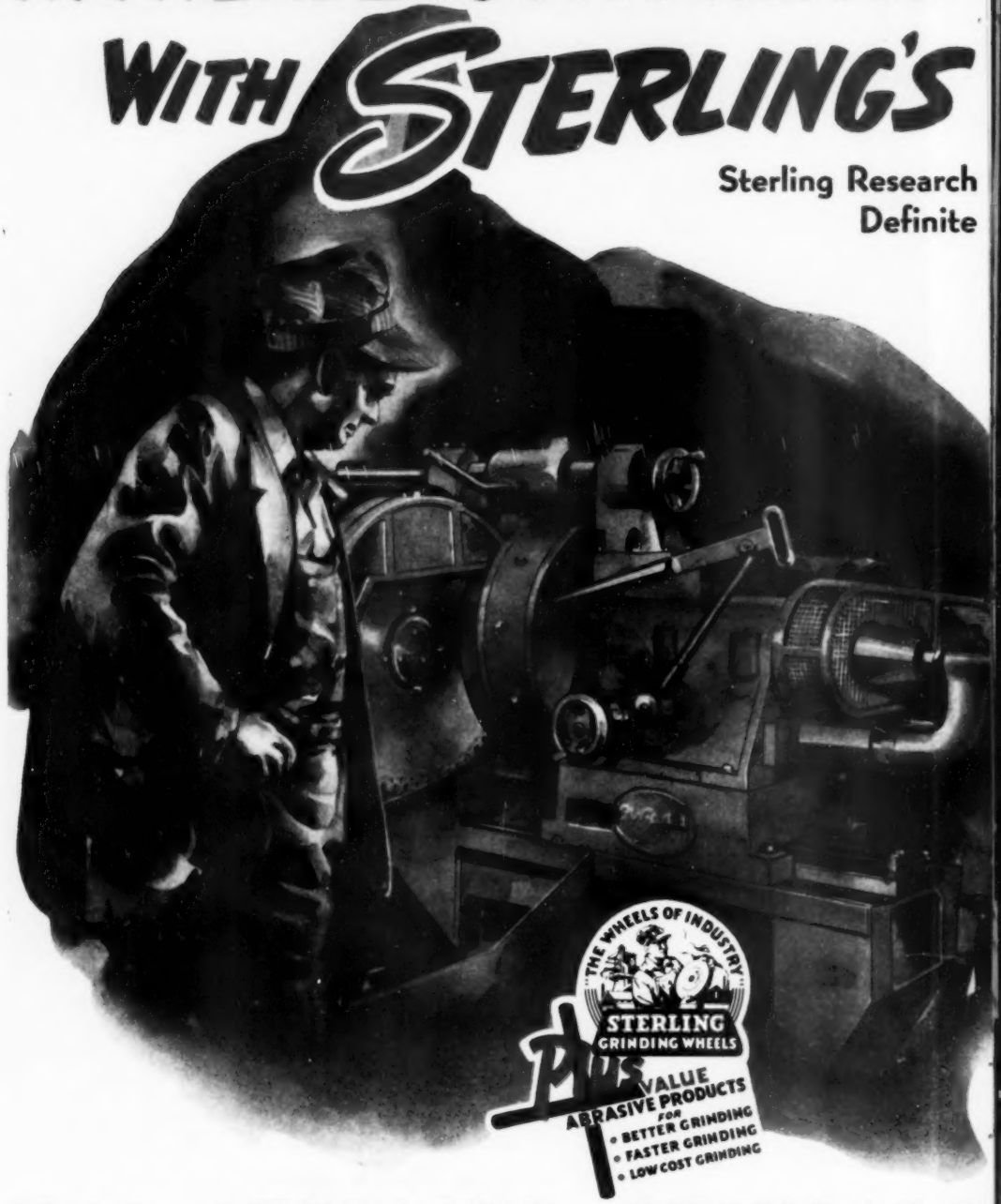
Sterling Research
Definite



THE STERLING GRINDING

AND PRODUCTION NUT-INSERTED DISCS

Has Created New Grain-Bond Combinations to Produce Resistance to Coolant Action . . . Uniform Performance

Using Sterling's New 200D Bond in our Nut-Inserted Discs not only provides coolant resistant qualities far beyond the ordinary, but adds greatly to the life of these superior abrasive units. This means lower grinding costs, less down-time, more finished pieces from each of these important "Wheels of Industry".

The free, cooler cutting action of Sterling's Nut-Inserted discs is supplied by the special Type K free-cutting abrasive grain which is now being used. Properly held in the disc by the new 200D Bond, this tested, highly refined grain offers longer grinding possibilities, assures more Production at much lower cost.

Specially designed, cup-shaped Nut-inserts are accurately spaced to fit the back-plates of any disc-grinding machine. This careful spacing creates a vibrationless abrasive unit that imposes no unusual stress on your equipment. Sterling's Nut-Inserted Discs take a wide variety of work, remove stock faster, accurately grind to unusually close limits, profitably push production!

Whether you grind wet or dry, make your problem our problem. Ask for the free services of a Sterling engineer who is well versed by years of experience on hundreds of disc-grinding jobs. Write us today.

BEST IN THE TEST --- THAT'S STERLING

In a recent test in a well known plant, Sterling Nut-Inserted Discs produced astonishing results surfacing Alnico Magnets. Where the usual production was approximately 20,000 pieces per wheel, Sterling's "Wheel of Industry" finished 26,000 without burning or checking. In some cases, Sterling's abrasive units proved their superiority by pushing up production to 30,000 units per wheel! Important, too, was the duplication produced by each of these nut-inserted discs. Naturally, the customer standardized on the best in the test--Sterling!

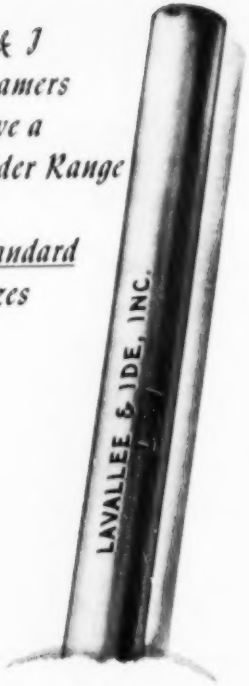
Careful study of your needs and the application of a test order of Sterling Nut-Inserted Discs should create results similar to those outlined above. May we make a test run on your machines in your plant at your convenience?

Ask for these STERLING
Research and Development Folders . . .

These are mighty important pieces of literature for you to have in a nearby file for ready reference. Many valuable grinding problems can be quickly solved by referring to them. Especially interesting is the fifth edition of the well known "Art and Science of Grinding" just off the press with carefully revised, up-to-the-minute data for foremen and workers. Send for your supply today.

WHEEL DIVISION STERLING TIFFIN OHIO

L & I Reamers have a Wider Range of Standard Sizes



Large Sizes
TO 1½"

Small Sizes
TO .040

The Reamer Specialists
LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

No Secrets

May I congratulate you on the splendid picture article you published on the new M-47 tank (*AM*—Aug 18 '52, p119)? However, I wonder if it was a wise thing to do. I'll bet the Russians are studying those pictures carefully already; and in Moscow, too. I don't blame you for wanting to get a scoop, and I am sure it was all arranged with the army, but why tell those (Deleted, Ed.) anything at all? They can piece together a lot of dope from scraps gathered here and there.

R Pinetti
Chicago

If reader Pinetti will study the pictures as carefully as he thinks the Russians will, he will find that no secrets are betrayed and that nowhere can he, or they, get a peek at the all-important insides. The ideas shown are far more useful in America, with our knowledge of mass production, than they could be anywhere else.—Ed.

Who Knows?

Some little time ago, I saw where a man in Cleveland had been granted a patent on the use of atomic energy for welding. Is there any real basis for this? Or has the patent office given him a patent on what seems to me like a wild dream?

A basic patent like that is a dangerous thing and could hamper important developments. According to that, could I take out a patent covering the use of water power for welding? I don't know how it would be done but, apparently, neither does he. I knew our patent office was antiquated, but I never thought it could be that dumb.

K Paffenhauser
Detroit

We do not know the details of the patent, so have no knowledge of what it covers. You would have to take up the matter with a patent lawyer. We admit it seems highly improbable right now, but who can tell what new developments the future will bring?—Ed.

Penny Wise

I was very much surprised to read (*AM*—Aug 4 '52, p109) that such an important company as Douglas Aircraft had not thought of making proper disk-grinding fixtures. It looks like a case of "penny wise and pound foolish." We have several disk

GRINETICS

BY D. G. SMITH

LIQUIDATION

BALL & SOCKET JOINT

AIR-COOLED

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WHO IS RESPONSIBLE

for the machine-tools in your shop?

- **The dealer who sold them?**
- **The Engineering Company that designed them?**
- **The factory that built the machine, tool, or fixture?**

Where can you get complete service and satisfaction?

With users of Microhoning equipment there is no possibility of divided responsibility. One organization sells, engineers, builds, and services the complete installation. Micromatic is proud to assume full responsibility for all equipment and the results obtained with the Microhoning process.

As the leader in the development of the honing process, Micromatic offers a complete line of equipment for processing all types and sizes of cylindrical and flat surfaces.

If your problem is production, precision, or costs let our organization of experienced engineers help you.

Write for issue of CROSS HATCH describing MICROHONING MACHINES

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MICROHONING MACHINES

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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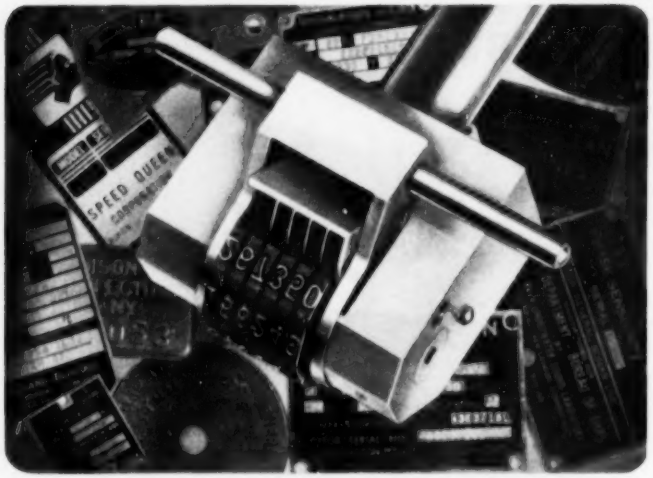
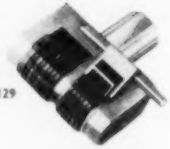
LEADERS IN INDUSTRY MARK WITH NOBLEWEST



Noblewest Numbering Heads

There's Nothing Finer For
PERMANENT NUMBERING

Whatever your numbering problem, a NOBLEWEST Numbering Head will do the job better. Automatic heads for serial numbering and non-automatic heads for selective numbering are available. Specially designed heads offer unlimited possibilities for *constant, selective* and *consecutive* numbering. For complete information write to Noble & Westbrook Manufacturing Co., 17 Westbrook Street, East Hartford 8, Conn.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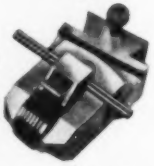
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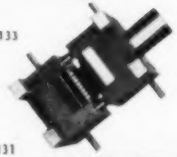
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MODEL 129: Special head combines set of automatic wheels and set of non-automatic wheels. Head stamps a serial number group and a random number group.

MODEL 151: NOBLEWEST Rocker Style Numbering Head. Designed for roll marking on flat surfaces. Dovetail shank fits NOBLEWEST marking machines. Both automatic and non-automatic models available.

MODEL 133: NOBLEWEST Embossing Head. Male and female wheels form raised characters in metal. Debossing heads for depressed characters. Both automatic and non-automatic styles.

MODEL 131: Includes wheels for automatic *consecutive* numbering mounted in special frame with permanent one-piece marking die for *constant* marking. Die is mortised for interchangeable steel type for *selective* numbering.

grinders in our plant and would not think of trying to operate them without proper holding fixtures. It is the only way to be sure of removing the proper amount of material in the proper places.

I always thought the big plants were on the ball when it came to the use of fixtures, and that it was only us little fellows who tried to get by with hand-held work. But it looks like we are a jump ahead in this case. I wonder if there are not a lot of similar cases in other big plants, where tool designers are so busy making large and elaborate fixtures for precision machining and assembly that they overlook the simple devices that only cost a dollar or two but which can sometimes save more in the long run than do the big fixtures.

R H Cranshaw
Cleveland

Why Bother?

I have noticed lately that *AM*, and a number of the other technical magazines, have been publishing a lot of information on titanium. I have seen articles on welding by several different processes, on several types of machining, and a good deal of general information. And I can't help wondering why you go to all that trouble. As I understand it, there have been only a few thousand pounds of titanium produced, so it would seem that all the data published thus far are based on a very limited amount of work.

It is understandable that the people who have done the work are proud of it and want to get credit by having it printed, but I think it is your duty, as a reputable magazine, to prevent the publication of unreliable and misleading information. I do not imply that the misleading is deliberate, but many readers may not stop to realize that published cutting speeds, for example, are based on experience with only one or two operations on only a few pounds of stock. Before such figures

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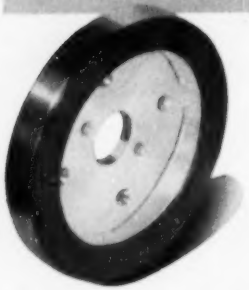
Grind More Carbide per Carat of Diamonds



...with STEEL-BONDED DIAMOND WHEELS

Wickman-Neven Steel-Bonded Diamond Wheels stretch wheel life—lower your carbide grinding costs because they're practically indestructible. They can't be damaged even by plunging sharp-pointed tools into them. Diamonds stay in place until worn to give more cuts per carat. These wheels also give up to 300% longer carbide tool service by producing a strong, uniform cutting edge that resists breakdown.

...and this VERSATILE BENCH GRINDER

Powered with a 1 HP reversible motor, the Wickman Model GF-3 is designed especially for carbide grinding with steel-bonded wheels or chip breaker grinding. It makes carbide cut-off work with steel-bonded wheels easy, economical. Built-in coolant pump and swivel table facilitate tool grinding with metal-bonded flaring cup wheels.

For the Complete story on Steel-Bonded Diamond Wheels, write on your letterhead for this new 24-page catalog. Resinoid-Bonded Diamond Wheels and Wickman grinders.

THE Wickman MANUFACTURING CO.

15533 WOODROW WILSON AVE. • DETROIT 3, MICHIGAN

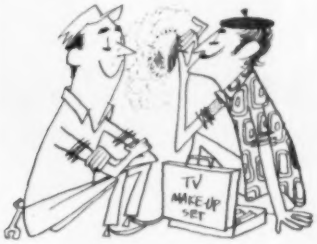
are published they should be backed by thousands of hours of work.

Besides this, who is ever going to use titanium? It is a rare and expensive metal and, while a few specialty people may need it, it will never come into such general use as steel or aluminum. So why bother with it?

T R Cranwell
Boise, Idaho

On the contrary, Mr Cranwell, titanium is one of the world's most plentiful materials and, while it is difficult and costly to extract at present, there is no doubt whatever that easier and cheaper methods will be found. Skeptics undoubtedly said the same things about aluminum, until Hall discovered how to obtain it cheaply. It is a little early to make predictions, but it seems probable that titanium will eventually take its place as one of the great structural metals, along with steel and aluminum.

As to the publication of machining and other data, we feel that we are performing a valuable service. The results of one man's research, even though scanty, provide a starting point for further research by others and avoid the necessity of each one performing all the preliminary work.—Ed.



Channel Zero

Is it true that television is being used in machine shops to permit operators to see what is going on in places they can't see? And if so, why can't I tune in and see these things at home? The next thing you know they'll be putting a camera in the men's room to see who's sneaking a smoke.

J Cross
Kansas City

Yes, television is being used to observe a number of operations and to permit remote control, especially in dangerous locations, but you can't tune it in because it is not broadcast. The camera and receiver are connected by a cable.—Ed.

Here's thrifty accuracy

...A REAL COMBINATION

IT'S BICKFORD

IT'S BULLARD

...for REPRODUCED ACCURACY without a single jig

Outstanding accuracy, increased production and cost lowering can be assured by using this natural combination of the precision Cincinnati Bickford Drilling Machine and precision Bullard Spacer.

Jig expense, as well as storage and maintenance costs, are eliminated.

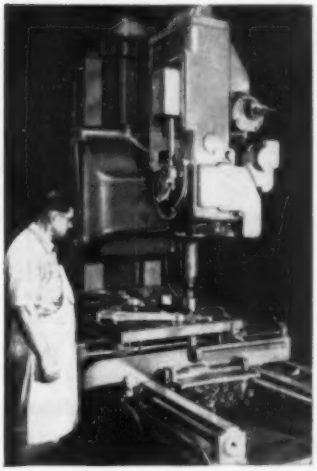
The new job can go into immediate production with interchangeable accuracy, with no lost time waiting for jigs and fixtures to be designed and built.

The wide range of speeds and feeds and the extra rigidity of the spindle and frame of this Cincinnati Bickford Precision Drilling Machine, and the convenience and ease of operator control, assure speed on the job and a wide range of use of the machine.

Actual production time is reduced as no jigs are handled by the operator.

For low cost, increased speed and great accuracy, look into this profit-making combination.

Write for Circular FH.



The Lockheed Aircraft Corporation, Burbank, California, finds the Cincinnati Bickford-Bullard combination ideal for fast, repetitive drilling on a variety of work.

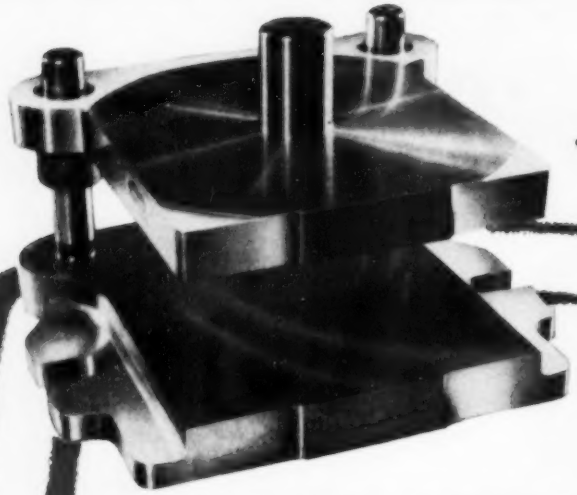
PHOTO COURTESY
LOCKHEED AIRCRAFT CORPORATION

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.



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helped FORD retool for '52

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*Indicates complete stock

DANLY

DIE SETS AND DIEMAKERS' SUPPLIES

SPOT NEWS of Metalworking

- **Armored 12-man squad car** will go along with Patton M-48 tank in battle. Tracked vehicle is to provide higher mobility and safety for infantry that cover tank and are covered by it.

- **Sandwich inline engine built up from unit cylinder blocks** is being tested. Aluminum blocks are brazed together to form V-block of theoretically any number of cylinders. Tests show new brazed joint is good. Advantages are economy, better block strength, versitility in engine size.

- **Patented plant-layout system uses 3-dimensional models** and photo-film templet. Prints can be made directly from the layout grid sheet. Method also standardizes layouts to same scale.

Russia graduates more engineers per year than we do. Quote from ASTE President L B Bellamy, "I doubt if you would like to look forward to transferring the technological leadership to a nation who has no respect for the rights of an individual. I know I want to and will do everything in my power to see that it doesn't happen."

- **Australia is most long-distance subcontractor.** A number of British firms have placed tentative contracts with Aussie metalworking shops, pending a Board of Trade OK. Vulcan Foundry in Yorkshire has subcontracted Centurion-tank parts to a shop in Melbourne. Value is a million British pounds.

- **West German Ford has new light motor bus.** It carries 42 passengers, but weighs only 4.4 tons, half the conventional ratio. Special lightweight chassis construction is the reason. Bus goes 100 kilometers per hour, power/weight ratio is 12.2 hp per ton.

- **British Comet Mark II and III Jet Liners interest US airlines.** Juan Trippe of Pan American and Eddie Rickenbacker of Eastern have both made trips to England checking on future delivery dates. Ship carries 60 passengers, can go 3000 miles. DeHavilland may have Mark IIIs ready by 1957.

- **Boeing is countering British leadership** by announcing demonstration soon of prototype jet aircraft for armed forces, and one for commercial airlines in 1954. Cost of project, based on experience with B-47 and B-52 jets, is reported to be $20 million.

Pallets are on the way out, according to one lone builder of lift trucks. Company bases statement on increased use of hydraulic clamps and other truck-controlled handling devices.

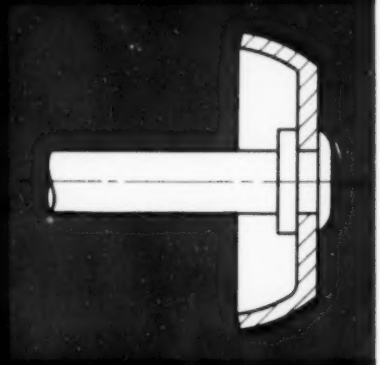
- **New ferromagnetic alloy has high mechanical strength** and good magnetic qualities. Temperature coefficient of elastic modulus can be controlled over a wide range. Material was developed during study of modulus of elasticity and how it varies with temperature.

- **Ceramic coating to protect mild steel from jet heats** may be possible. Experiments indicate that present coating work has only scratched the surface. Jet parts are now alloy steel coated with ceramics, but coatings for mild steels have been developed, although they will not yet stand the temperatures required. Jet costs would drop quickly if it works.

- **Bonneville Power Administration cut service because of low water level,** closing two out of eight Kaiser aluminum potlines in Spokane, and reducing output of Alcoa's Vancouver plant and Reynolds' Troutdale installation.

- **Thin stainless can be butt-welded** with technique developed at Naval Ordnance Lab. Gimmick is bank of capacitors, which store charge, then release it in 0.001 to 0.01 sec. Flanges only 0.0077 in. thick have been joined this way.

Ex-Cell-O Style · 2112-A
Precision Boring Machine.



Partial sectional view of assembly shows the operation in heavy lines.

Precision Turning

ON AN EX-CELL-O BORING MACHINE

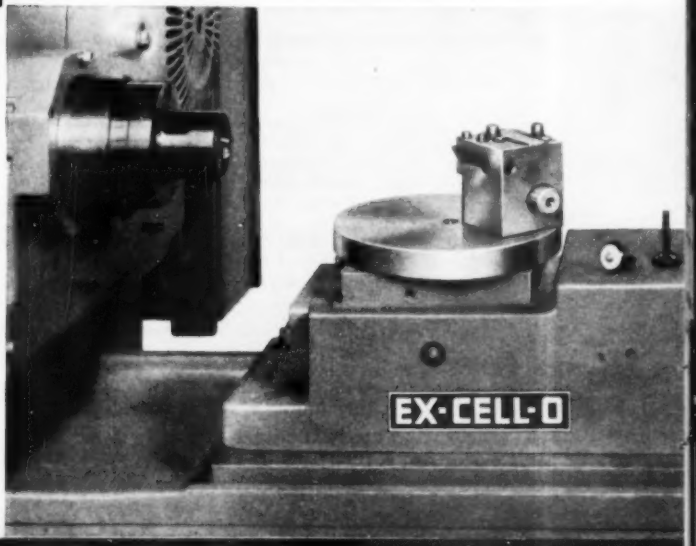
Accurate Radii Turned at High Speed on Stainless Valve Plunger Assemblies

There are many jobs on Ex-Cell-O Precision Boring Machines that have nothing to do with boring. For example, here's a Style 2112-A single-end machine equipped for precision turning the radius on a valve and stem assembly.

The stainless steel assemblies are held in a collet chuck on the spindle. The turning tool is held in a tool block on a turret which is actuated by a hydraulic cylinder through a rack and pinion. Net production is 109 pieces per hour.

For further information on the many uses to be made of Ex-Cell-O Precision Boring Machines, see your local Ex-Cell-O representative or write for Bulletin 31205.

Close-up of spindle and tool block on Ex-Cell-O Style 2112-A Precision Boring Machine equipped for precision turning an accurate radius.



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EX-CELL-O for PRECISION

EX-CELL-O

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DETROIT 32, MICHIGAN

52-14

Washington

Sen Lyndon Johnson's report on aircraft procurement stirred Washington dust, but it didn't do much else. The preparedness committee hit at "Gimmickry" as the cause of lagging aircraft production, but failed to take note of DPA's report to the Aircraft Production Board that made specific recommendations (*AM*-Aug 4 '53 p 81) for speeding up plane output. "US planes are too complex and costly" said Senator Johnson.

Most Washington sources pass off the report as political headline hunting. Reason is that the conclusions had been so well-aired that they were stale by the time the report was published. It got notoriety only because Washington was suffering from summer's-end doldrums.

• • •

But not all the Johnson report can be scoffed at. A perfect example of Air Force leaning toward complexity and costliness is the B-66 jet bomber, now being turned out for the Navy as the A3D. By the time the Air Force got through designing the plane, it was heavier, slower, and cost more than the Navy's version.

That's why Johnson's recommendations are not to be taken lightly. The Senator again urged for a full-time production czar to handle procurement problems—and cut just such waste. To many Pentagon chiefs, this is just another indication that Congress will force through a single service of supply if procurement isn't cleaned up come next year's budget hearings.

That's also why Hugh Dean, former production vp of General Motors, is coming to Washington to take over the Pentagon job left vacant by Clay Bedford's departure. He will attempt to troubleshoot defense production.

• • •

Some DPA-NPA brass are crying wolf about steel. They say the situation is so tight that controls will be necessary well into next year. But top brass are packing trunks, ready to call off about everything except priorities for military and AEC needs after the first quarter.

The people who hand out allotments are having trouble convincing anyone that steel is tight for the fourth quarter of this year. It is—but the situation will ease by the first of the year.

Allotment people think decontrol talk makes it harder to convince manufacturers they can't get all the steel they want right away. Even though you tag the decontrol talk for next year, a lot of businessmen are putting on the pressure to get full steel requirements for civilian goods in the fourth quarter this year.

• • •

A long-range plan for machine-tool and industrial-equipment stockpiling is in the works. That's what an ODM committee headed by Studebaker's Harold S Vance has in mind. Figuring is that the Vance committee will come up with a five-year program to get the rest of the tools and equipment the nation would need in all-out war.

Committee report is due late this month. It will probably urge General Services Administration—which has some money for tools—to begin buying them on a small scale this year.

• • •

Many weapons schedules will get cut back next year. Reason is we are nearing the level-off point on arms production. On automotive equipment, smaller ordnance items, tanks, and spare parts the main contracts will be to sustain the force now in existence and to take care of attrition. That's part of the "productive-capacity-rather-than-weapons-now" plan put into operation by General Marshall in December 1950.

But the sustaining cost will be high. With decreased production, it costs more to keep lines open. For example: the Army cut production of the T-41 tank by 20% for the next year and a half. But that meant the cost went up about $20,000 per vehicle.

Defense planners say increased costs are inevitable. That's part of the price we're paying to keep skilled help in defense production and keep lines open that can be expanded rapidly.

• • •

Taft-Hartley won't be repealed no matter who wins the election. That is, we won't go back to the one-sided Wagner Act. But the chances are good for revising the law. Governor Stevenson would go further than General Eisenhower.

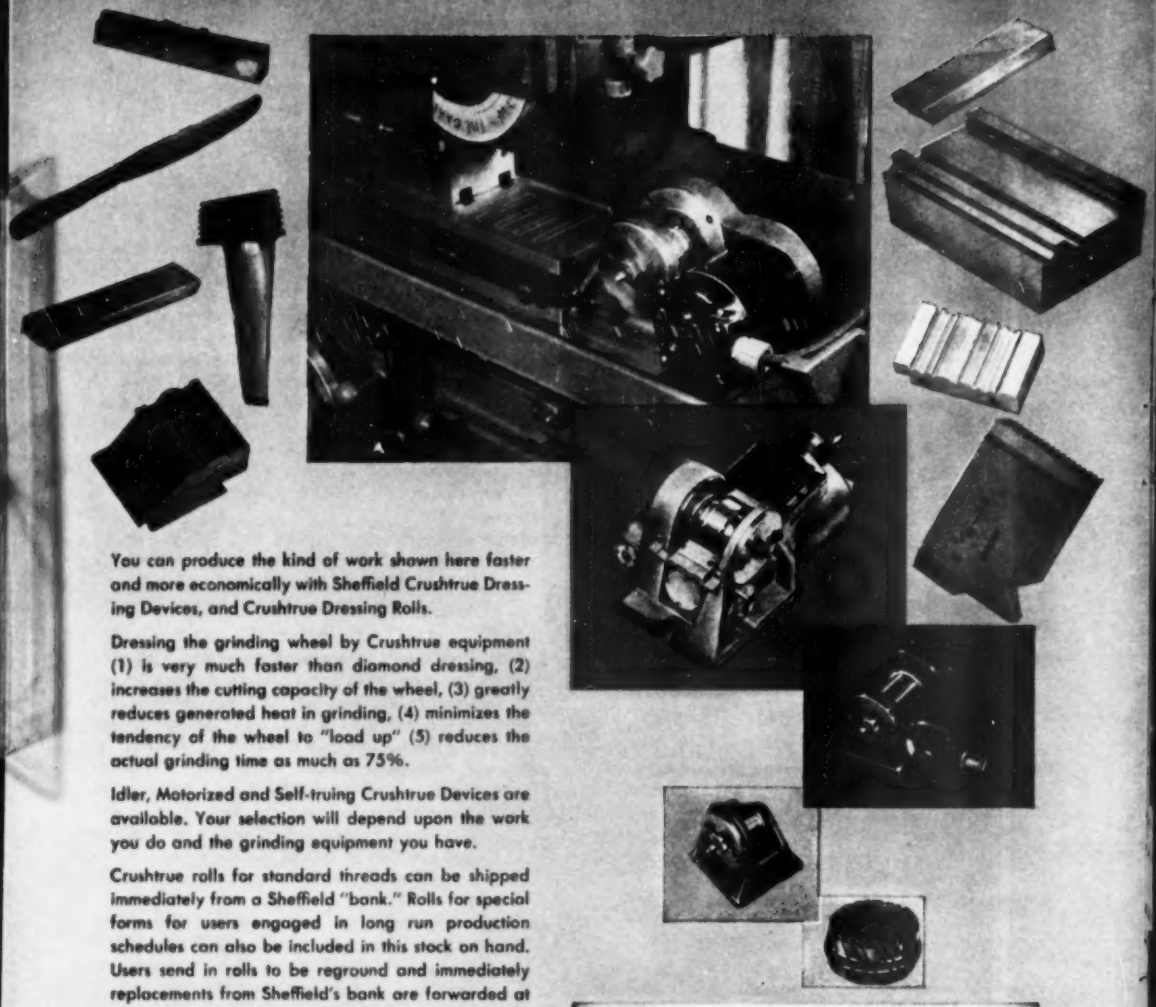
Governor Stevenson stands about with President Truman on this point. He would balance the Wagner Act by keeping the Taft-Hartley unfair-practice rules against unions as well as employers. But he would kill the labor injunction and would sanction most secondary boycotts.

In national emergencies like a coal or steel strike, Governor Stevenson thinks the White House should have several alternative weapons—including seizure, but excluding the injunction.

• • •

Left-wing metalworking unions are being investigated by two Congressional committees seeking to expose communist influences. The electrical and farm-equipment workers are objects of a house un-American-activities-committee inquiry. The McCarran Senate subcommittee will look into the smelter workers next month.

Equip for Crushtrue Grinding to Speed Production and Cut Costs



You can produce the kind of work shown here faster and more economically with Sheffield Crushtrue Dressing Devices, and Crushtrue Dressing Rolls.

Dressing the grinding wheel by Crushtrue equipment (1) is very much faster than diamond dressing, (2) increases the cutting capacity of the wheel, (3) greatly reduces generated heat in grinding, (4) minimizes the tendency of the wheel to "load up" (5) reduces the actual grinding time as much as 75%.

Idler, Motorized and Self-truing Crushtrue Devices are available. Your selection will depend upon the work you do and the grinding equipment you have.

Crushtrue rolls for standard threads can be shipped immediately from a Sheffield "bank." Rolls for special forms for users engaged in long run production schedules can also be included in this stock on hand. Users send in rolls to be reground and immediately replacements from Sheffield's bank are forwarded at nominal cost. This relieves the user from the expense of ever having to buy new rolls.

Write for information on the Sheffield "Crushtrue Roll Bank" and specifications on these Crushtrue Devices.

5478

the *Sheffield* corporation

Dayton 1, Ohio, U. S. A.

GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS
CONTRACT SERVICES • THREADING TOOLS

Detroit

Machine-tool makers might chew this one over. The statement was made in conversation by a leading automobile engineer:

"**To build quality into cars,** we must rely more and more on pieces, less and less on men. We must design and engineer so the piece itself is perfect—bypass the need for fits and repairs. Naturally that spills over into manufacturing, beyond engineering. All our long-term thinking is being done on that basis."

• • •

Production and employment are bounding along merrily here in the wake of the steel strike. Daily operations in the auto industry, cars and trucks, U. S. and Canadian plants included, were resulting in output of some 25,000 or more assemblies each day as the turn was made into September. That's a half-million-a-month clip, nothing to be sneezed at in any times—and particularly good as the slackening end of the model year approaches.

Employment is almost back to normal. In late August, the job-insurance claims in Michigan dropped from 194,841 to 146,603; in Detroit alone the benefits claims fell off 25,000 to 109,314.

Cries of worker scarcities are being heard, in fact. Specialists are as hard to get as ever.

• • •

Canny machine-tool buyers in the auto industry are placing orders—contrary to expectation—in companies which have substantial defense-goods backlogs. They figure this is a better bet than putting their commitments where they are preceded by equal backlogs for civilian requirements.

The reason? Military orders may be canceled (especially after November). Civilian orders, they figure, are solid. The best bet, therefore, lies with the companies whose backlogs are heavy militarily.

• • •

Makers of special equipment, particularly testing equipment, are waiting eagerly for confirmation of what they have heard very quietly in recent weeks—that Chevrolet and other GM divisions will be setting up more-or-less complete engineering development centers, probably near the General Motors Technical Center in northeast Detroit.

In these centers, which will cost millions, the divisions will function in an operating-level way the same as General Motors itself functions in a staff way—and Chevrolet, for that matter, may lap over onto some staff functions as well, like research (for which it recently named an assistant chief engineer).

General Motors, in other words, has come around to figuring that Chevrolet is by itself larger than any other single nameplate in the industry, and almost as large by itself as the entire Ford Motor Co or Chrysler Corp. To protect that prodigious position, the corporation is giving its big division a lot of leeway.

• • •

Detroit, therefore, is doing a lot of gossiping about what Chevrolet will bring out during the next few years to meet the challenge which has been thrown down by Ford in recent years. For 1953, it is known, Chevrolet will have a new body shell. But that is only the beginning. There will also be a considerably improved powerglide transmission and a higher-horsepower engine.

A completely new powerplant will be released for Chevrolet as rapidly as the bugs in new-engine development can be worked out. This will be the first completely new unit since the early '30s. Target date: 1955.

It looks like a real free-for-all fight, and Detroit—where competition is ultimately and essentially always a bare-knuckle affair—is anticipating it with relish.

Packard's Pan American, a custom sports car with a modified stock motor, is touring around the country for exhibit and reaction testing. Packard people very frankly have ideas that if the car catches on as well as they expect—and it probably will—they might put it into production.

Studies have been made on stamping out some of the big sections of sheet metal in the body; and apparently a little casting has also been done. Don't be too surprised if Packard rapidly makes an expensive sports-car offering—it's one worthwhile way to recapture some of the prestige the new Packard regime feels the company has lost in recent years.

New-engine tidings: On the basis of initial releases for the Pontiac V-8, it appears that it will be 1955 before these powerplants come out—just about in line with Chevrolet.

Somewhat earlier may be a new line of V-8 engines by International for both its truck and tractor lines.

Machine-tool representatives keep sitting in the Chrysler Engineering lobbies waiting for Plymouth engine releases. From day to day, however, final decision on release of the powerplant developed at the laboratory is being held up.

Hudson, like practically everyone, has a V-8 engine in advanced development stages, but how soon something may come of it is problematical. The Hudson inline six turns out plenty of horsepower right now, and people in that company figure they are well set for at least a few years.

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Machine Tools

Machine-tool buying for defense tooling looks about like this: Perhaps $300-$350 million to be placed in the five-month August-December period.

Around $300 million or maybe a little more will be purchased in calendar 1953.

To the 1953 volume would be added civilian orders roughly estimated at $300-$400 million.

• • •

These guesses are made on the assumption that things will continue as they are and that no new incident comparable with Korea will occur.

The figures represent the pooled judgment of a number of government people intimately acquainted with the machine-tool situation and with the uncertainties at Pentagon.

The armed services obviously hold the key to the situation. The question is: How much money will they have for production equipment? How much money that they can divert to machine-tool purchases will they be willing to divert?

One observer points out that Pentagon could well afford to set aside a relatively small ratio of its end-product funds (planes, guns) with which to buy machine tools. But will it? Nobody, not even the military, knows.

• • •

Bear in mind these little-publicized figures: Congress has appropriated $130 billion for military procurement and construction.

Contracts have been let for $80 billion of that amount, $34 billion of it having been delivered as goods or facilities.

$50 billion of funds already appropriated are yet to be contracted for. If deliveries continue at the current rate on undelivered orders and on orders yet to be placed, current program will take at least 40 months to finish.

This means that we are only about half-way along in our defense-production program.

• • •

There is a lot of talk around Washington about a big ship-propulsion-machinery program. It involves new concepts of ship speeds and how much horsepower is necessary to attain these speeds.

It would require large numbers of machine tools, especially the "elephants," such as boring mills and gear-cutting equipment.

But truth is that the program is merely in the preliminary stages. It is nowhere near the point at which a decision will be made. The ordering of machine tools is some time off.

• • •

General Services Administration still is wrangling with Pentagon over responsibility for pool orders. If GSA should get stuck with settlement of too many terminations and cancellations, it will not be able to finance any more orders until it gets more money from Congress.

Comptroller General has rapped GSA's knuckles several times, ruling that GSA was augmenting Defense Department programs unnecessarily.

That's what happened in big presses. Air Force was ordered to buy after GSA tried to start a buying program.

GSA doesn't know how far it can go in buying unrated machine tools, which it could add to the national industrial equipment reserve, without disrupting military orders.

• • •

Office of Price Stabilization never intended that its revision of GOR-2, Section 31, should apply to machine-tool builders.

This provision requires defense prime contractors and subcontractors for commodities to be delivered to defense agencies to include in the proposal and contract a statement of the ceiling price as well as of the actual price charged.

But it may take a while to rectify this mistake. Meanwhile builders are stuck with necessity for conforming to the rule.

• • •

Opinion is deepening that the Vance committee, in its first big report toward end of this month, will advocate a sizable outlay of government money for long-lead-time machine tools to be built against the day when they may be needed in a national emergency. It might take as much as a billion dollars.

This is a program which may extend over 4-5 years. It would take time to get it going. First would come the Vance committee recommendations. Then a high Washington agency, perhaps Budget Bureau or preferably the White House, would give the nod in the form of a definite order to proceed.

The money probably would have to come from new appropriations from Congress next year.

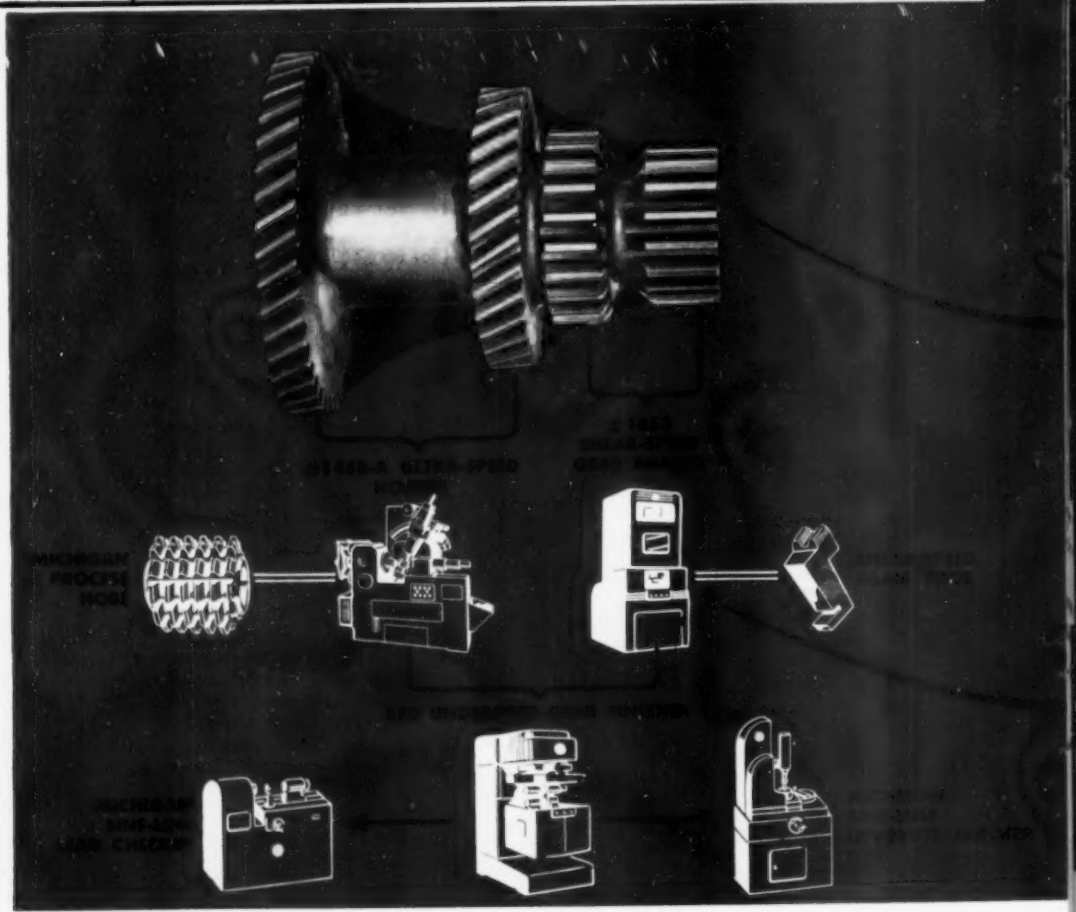
• • •

This proposal, in a sense, would be part of an "over-tooling" program for existing defense plants which would broaden the base of industrial mobilization for all-out war.

High government officials say that a complete long-term over-tooling program would cost $4 billion. And some of these officials are strongly opposed to any stockpiling of new machine tools. Forward purchases should be made only for specific projects.

Only exception would be in the case of the "elephants."

40 teeth 8 DP 5⅛" P.D. ⅝" face	31 teeth 8 DP 4½" P.D. 1" face	21 teeth 7/9 pitch 3" P.D. 1" face	17 teeth 7/9 pitch 2½" P.D. 1¼" face	(as shown below) gear	
81 seconds	67 seconds	38 seconds	48 seconds	Estimated cutting time	cutting
32/hr.	37/hr.	56/hr.	48/hr.	Gears / hr. at 85% eff. per machine	
60 seconds	50 seconds	48 seconds	45 seconds	Estimated cutting time	finishing
41/hr.	47/hr.	48/hr.	51/hr.	Gears / hr. at 85% eff. per machine	



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ON GEARS LIKE THESE

TOOLED WITH THESE MACHINES

THE TIME TO PLAN YOUR GEAR PRODUCTION....

The best gears are produced at the lowest cost when (a) each production step is tooled for maximum efficiency and (b) all steps of the line are properly "coordinated"—from blank to finished gear.

That is where Michigan Tool Company comes in.

That is why we have developed so complete a line of gear production equipment—machines and tools for practically every step, including gear cutting, finishing and control of quality.

We would like to help you improve your "line coordination," help you cut costs and rejects, increase output per machine and man hour, improve quality.

An invitation from you to have one of our engineers visit your plant and discuss your plans and problems with you will be appreciated.

May we hear from you?

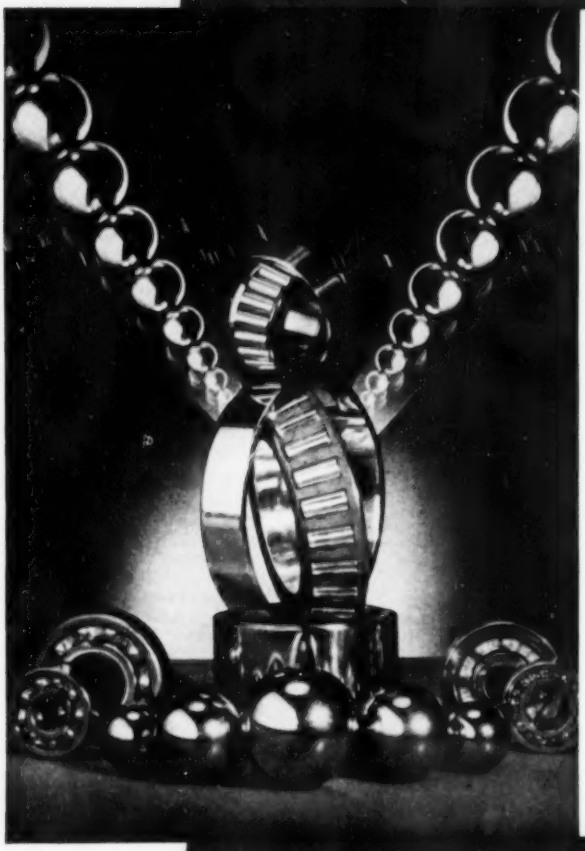
MICHIGAN TOOL Company

from blank to finished gear

ROIT 12, MICHIGAN, U. S. A.

LESS DOWNTIME, MORE PRODUCTION

for Hoover Ball and Bearing Company



As one of America's leading bearing manufacturers, Hoover Ball & Bearing Company, Ann Arbor, Michigan, is always searching for ways to step up production and improve quality. In the course of this never-ending program, Hoover called in a Texaco Lubrication Engineer for consultation.

The Texaco Lubrication Engineer studied thoroughly all the problems involved, then made recommendations which included changing from a competitive grinding oil to a 1-to-50 emulsion of *Texaco Soluble Oil D.* The change was made. Now production is up, costs are down because, with Texaco –

- *machines stay clean*
- *grinding finish has improved*
- *there is no rusting*
- *emulsion filters properly, does not separate, lasts far longer*

Here again is an example of how Texaco quality products plus the know-how of Texaco Lubrication Engineering Service enable all industry to do its machining better, faster, and at lower cost.

To enjoy these benefits in your plant . . . whatever you are making, wherever located . . . just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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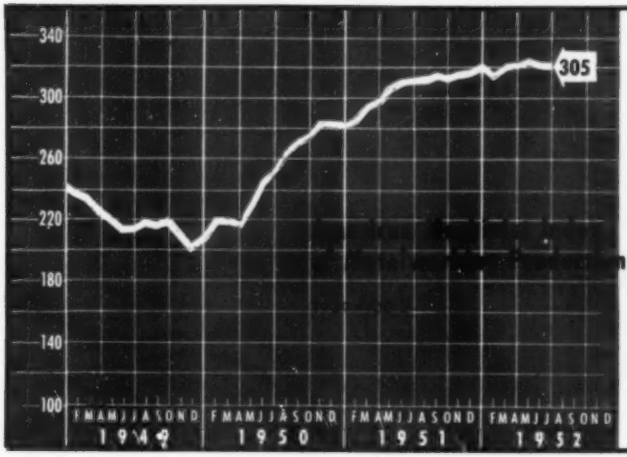
Faithfully yours 50 TEXACO *for Fifty Years*

TUNE IN: On television—the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station.

Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUG. '52(*)	JULY '52(p)	JUNE '52(r)	JULY '51
	305	**293**	**320**	**311**
Machinery	308	316	310	
Electrical Manufacturing	339	349	342	
Automobiles	140	228	219	
Other Transportation	540	538	433	
Other Metalworking	288	306	317	

*Estimated (p)preliminary (r)revised

Metalworking, along with industry in general, will do very well the remainder of this year.

Operations are back up close to where they were before the steel strike. The strike pulled down metalworking production, especially automobile manufacture.

• • •

July was the low spot (but bear in mind that it was still 293 on the American Machinist Index, with 1939 as 100). August crept up some. And final figures should reveal that September erased the decline which set in during July.

Things are looking up all along the line for the fourth quarter. Consumer products makers are more optimistic than in a long time.

• • •

The heavy-goods people are doing extremely well, with production being partially supported by the gradual but steady expansion of armament output.

Take a look at the production-equipment situation. Machine-tool orders, which lagged all year until July, have been doing all right since then. And fall demand should be brisk in such fields as textile machinery.

• • •

Tool and die sales are up 45% this six months over last year. New orders are down 5%, but backlogs are still equal to three months' production so no danger is felt.

Cutting-tool people look for better business toward the end of the year. Second quarter was slow, third will be worse. Tool inventories were built up excessively, but will taper off in the fall. Tool-steel supplies are ample except for a few special items.

Appliance industry has nearly full steel supply. Big worry here is increased costs, which can't readily be passed on to buyers because of high competition in the field.

Farm equipment is in fair shape, with heaviest lines doing best. Producers are optimistic about their ability to sell tractors late in the year. Bad spot is light lines like plows, harrows, and rakes. They'll be down from last year's level.

• • •

Auto-parts makers are happy with prospects for the rest of the year, but have doubts for next year. Main factor is higher costs and buyer resistance.

Auto output is down 35% or so from last year in the first eight months of this year, so market should hold up well for a while.

• • •

Forging business is fair to good, with backlogs at 5½ months instead of the usual 3 to 4. Production will drag for a while because of carbon-steel bars.

Stampers have good orders. Inventories were shot, so production will pick up slowly. However, backlogs are meagre except for some defense producers.

• • •

Alloy-steel production is highest since '44. Note that it's up more than use of alloying elements, caused by use of boron which allows smaller alloy content.

Metal supplies look about like this: Steel supply should balance demand early next year. Look for return to 45-day inventory. Copper is plentiful now, but government stockpiling may make things rough next year. Same applies to aluminum. Alloy elements can be bought on monthly basis now.

Gaging Business

PRICE INDEX

	AUG. '52(*)	JULY '52(p)	JUNE '52(r)	JULY '51
	129.6	**129.4**	**129.4**	**127.8**
Metalworking Machinery	136.6	136.6	133.2	
Other Machinery exc. Electrical	132.2	132.2	132.2	
Electrical Machinery	124.9	124.9	127.2	
Fabricated Metal Products	127.8	127.8	124.8	

(*)Estimated (p)preliminary (r)revised

Business will climb for the next six months. Consumer buying is now at an annual rate of $215 billion, and should be close to $220 billion by March '53.

• • •

Steel is back to 100% of capacity. It only took six weeks to get there after the strike, but, surprisingly, there's no big rush for steel now. There will probably be enough for civilian goods, even after the military producers take their big slices.

• • •

Investments in new plant and equipment are at $27.7 billion a year, and will increase maybe another $2 billion by early next year.

Defense spending will keep pushing up through early '53, but won't increase as fast as it has. It may peak at about $54 billion, $4 billion over present level, in about six months.

Machinery and vehicle exports are 12.4% ahead of last year, mainly because of military aid. Six-month export total for the first half of this year was $2.7 billion.

• • •

Future trouble spot is raw metals. Manufacturers' inventories are high now, and will still be fairly high as defense goods are finished. Wholesale and retail trade have gone through inventory liquidation, but manufacturers have not. Therefore, some price adjustments may be due for metals next winter.

• • •

Cost of living will inch up to new highs, but monthly gains won't be bad.

• • •

Construction is having a big year, despite restrictions and credit controls. Housing will hit 1.2 million starts this year, only slightly under that next year.

Construction machinery hit $467 million in the first half of this year: $224 million the first quarter, and $243 million the second.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	242.1	239.9	230.3
Steel ingot operation (thousands of tons)	2,077	2,069	1,965
Electric power output (million kilowatt hours)	7,646	7,718	7,146
Production of automobiles and trucks	125,001	109,588	137,479
Engineering construction awards (*Engineering News-Record*, millions)	$110.0	$353.9	$160.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	366	374	200
Vacuum cleaners sales (thousands of units)	180	207	161
Washers sales (thousands of units)	208	274	140
Household electric ranges sales (thousands of units)	84	88	63
Radio production (thousands of units)	442	874	548
Television production (thousands of units)	199	361	150
Gear sales index (1935-1939 = 100)	453.9	452.3	589.1
Foundry equipment new orders index (shipments, 1937-1939 = 100)	343.9	353.8	390.3

* Seasonally adjusted.

New Flexible Sealing...

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Designed with revolutionary application of

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It's *sealed with pressure*—a revolutionary T-J application of flexible sealing that insures positive cushion action combined with automatic valving action for fast return stroke . . . eliminates binding and sticking . . . operates with *low friction, minimum wear,* and *added power* due to higher efficiency.

More PLUS features! New type packing nut incorporates a piloted diameter, assuring perfect alignment. Improved rod packing increases sealing efficiency. Piston rod and internal cylinder tube surfaces are hard chrome plated—a standard practice with T-J for over 15 years.

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8. "O" ring static seal.
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10. Fine cushion adjustment.
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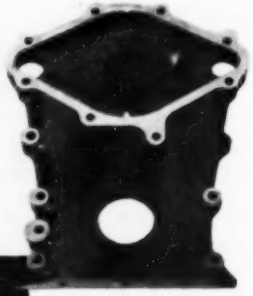

DRILL	19	HOLES
ROUGH BORE	2	HOLES
FINISH BORE	1	HOLE
CHAMFER	7	HOLES
REAM	1	HOLE
TAP	6	HOLES

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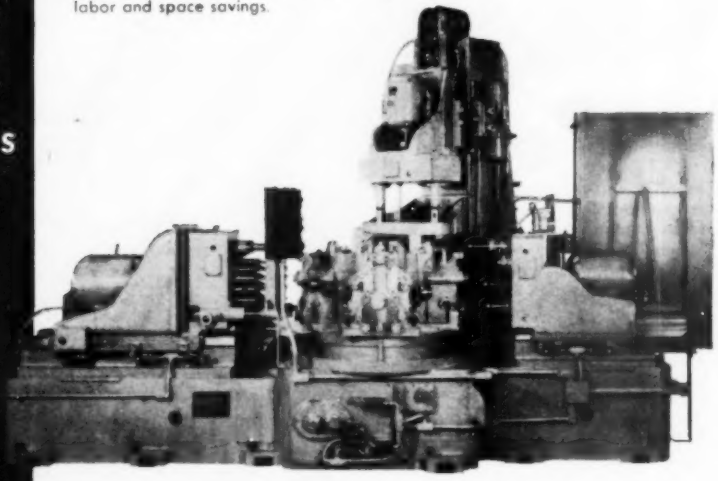

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Builders of MOR-SPEED Tools

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THE MORRIS MACHINE TOOL COMPANY
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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

What to Do About Engineers

INDUSTRY has been loudly lamenting the shortage of engineers. And so have the national engineering societies.

In this critical situation, it seems appropriate to ask: "What is being done to see that engineers now on the job are being used to the best possible advantage?"

Someone has estimated that careless assignment of engineers has caused a 25% wastage of those available. With engineers at a premium, the sensible thing to do is to use them on work which really requires their technical knowledge and skill. Beyond that, they should be trained for bigger and more responsible jobs.

THE INDUSTRIAL DIVISION of Minneapolis-Honeywell Regulator Co. is seeing that this is done. It is stretching out its engineering personnel over a larger area by freeing the men from routine tasks that non-engineers can do just as well.

Blueprinting, production scheduling and purchasing are among these tasks. Men with less technical training and clerks can perform these duties satisfactorily.

On top of that, certain work formerly assigned to engineers now is done by instrumentation. Testing and quality control are carried out automatically.

Minneapolis-Honeywell does not stop at that point. It also has a post-school educational program—the long-time training of its engineers.

This intelligent and constructive program is paying off. In fact, its success can be measured. The company's staff of engineers has expanded sharply, but the amount of engineering work being handled has increased even more. Fewer engineers are getting more work done.

IN VIEW OF the dire shortage of engineers, metalworking managements should do whatever they can to make the available supply go farther.

Be sure that your engineers are at work on engineering jobs. Make certain that they are not tied up on projects which could just as well be carried out by employees with less technical training. Give them helpers, for one thing, to do routine calculations.

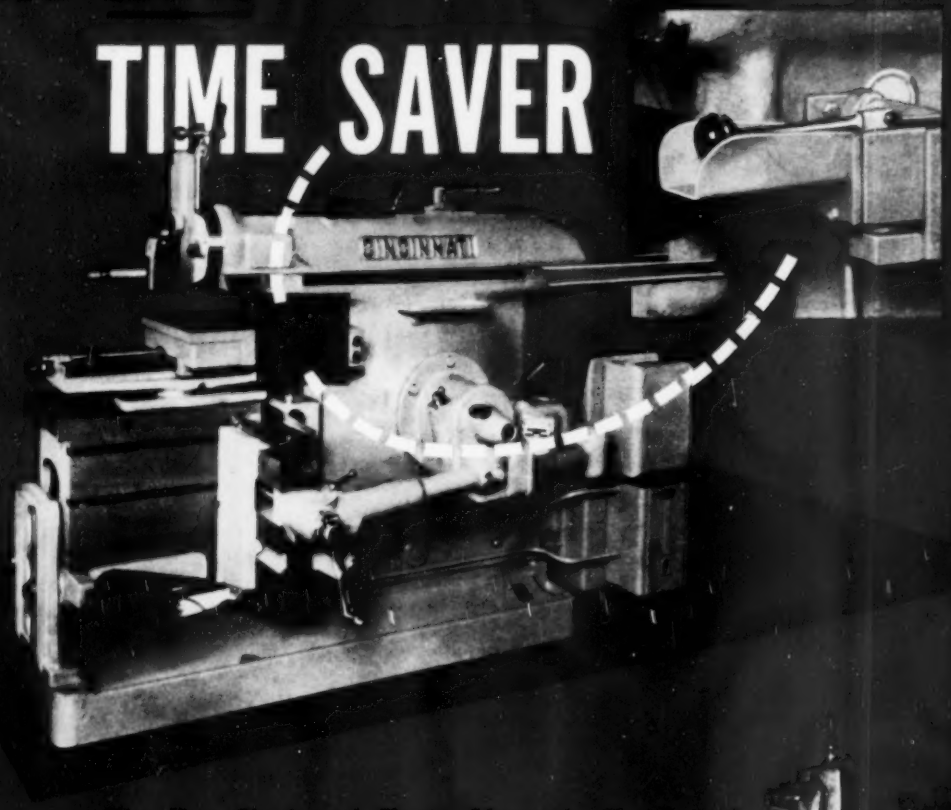
Consider a series of well-planned lecture forums for training and upgrading your engineers. Many firms mistakenly take the attitude that on-the-job experience is sufficient training and that formal classwork should end with college days.

Take the time and trouble to look into the situation in your plant. You may be surprised to discover how much more work you can get out of your engineers than you are getting now. And don't overlook the fact that the engineers themselves will love it too. They naturally like to spend their time on jobs which challenge their engineering skill and which benefit you the most.

Burnham Finney

THE NEW

TIME SAVER



The New Cincinnati Electro-Magnetic Clutch and Brake alone brought a 35% time-saving leap. . . .

Starting and stopping are always non-productive, but where starts and stops are numerous and cutting time is a very small part of the entire work cycle—they become a serious time waster!

The New Cincinnati Magnetic Clutch and Brake, with its simple, convenient control lever, converts waste time into productive time. It gives the operator the fastest, smoothest and most accurate control of his Shaper.

This powerful clutch and brake requires no shutdown for adjustment, and has a long, maintenance-free life, time-saving and profitable features.

Write for Catalog M-5 for the complete line.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

MEN OF "PARTS"

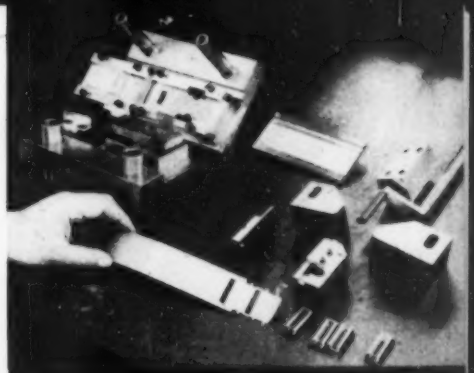
watch machines work at Sylvania...

here's why...

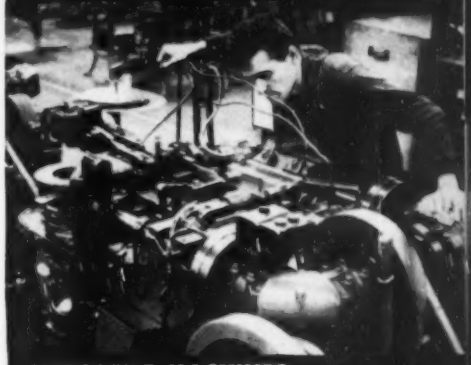
BY E J TANGERMAN, EXECUTIVE EDITOR and
GEORGE H DeGROAT, ASSOCIATE EDITOR

Plastics, wire, sheet metal, and mica are processed in the 13 plants of the Parts Division, Sylvania Electric Products Inc. They are widespread geographically, but specialized and relatively small. Characteristic of all plants is emphasis on high quality and automatic operation, and a basic plan that all machines and tooling shall be versatile and broadly applicable. This demands alert management on the spot, compact organization, ingenious tool engineering and construction, and careful material and process control.

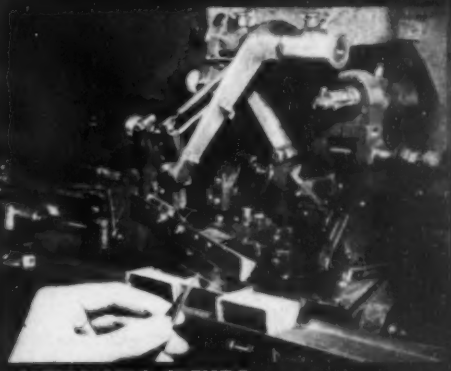
Two editors of American Machinist, invited to make the first "tooling tour" of these plants, chose two in Warren, Pa., and one in Emporium, Pa. Presented here in pictures and captions are the setups they selected as of broadest interest and applicability for our readers in any branch of Metalworking. Here are ideas in wire plating, drawing, and welding; steel-sheet carbonizing and slitting; pin rolling; plastics molding; and assembly at Warren; as well as metal-parts manufacture at Emporium. Dies for presses and multi-slide machines, produced at Warren, Emporium, and Cleveland, are detailed. Photographs are by Jim Burns.



INGENIOUS TOOLING



VERSATILE MACHINES



AUTOMATIC SETUPS

CONSTANT, CLOSE CONTROL

**American Machinist SPECIAL REPORT No. 318
TO THE METALWORKING INDUSTRIES**

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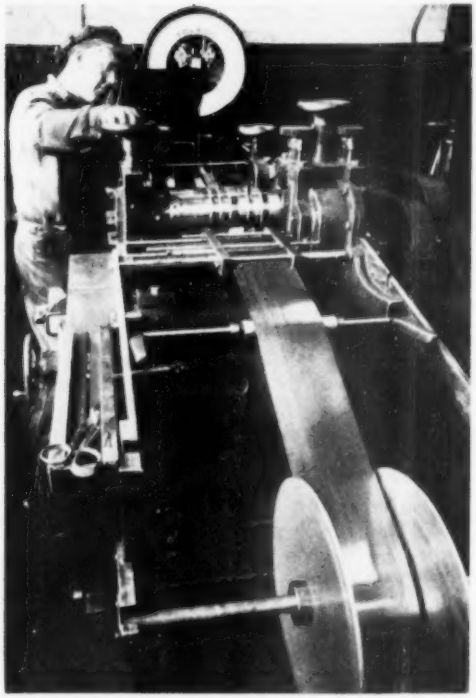
SIX THOUSAND FEET of sheet steel a day are carbonized in a furnace that handles six passes of the coil at a time. Stock traveling at 6 ipm is wound on reels after passing through flame curtain. Sheet is 6 in. wide now, but plans are to increase capacities to handle 8 in. strands

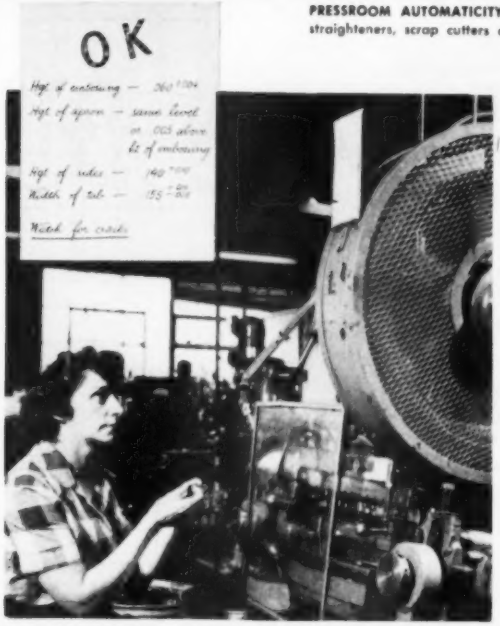
Sheet Steel Is Carbonized and Slit Before Forming

Nickel steel for tube parts is carbonized to absorb electrons when tubes heat up in operation (black bodies absorb more) then slit into convenient sizes for multi-slide and press work. Stock is maintained in 6-in. widths as a "fluid inventory" — suitable for splitting into required widths as needed without delays or shortages. Both annealed and unannealed steels are handled here, the "soft" material (annealed) being oxidized first to get the proper surface conditioning for carbonizing. Oxidizing is done at 25 fpm in an electric furnace operating at 1600 F. Annealed material is then carbonized just as "hard" material is in a gas-fired furnace at 1030F. Speed is 6 ipm in propane atmosphere. After carbonizing, stock is run through an automatic wire-brush buffer to remove the loose layer of carbon from both sides. When one side is to be bright, a stiffer wire brush buffs carbon off one side only. Slitting follows



TAILOR-MADE PRESS STOCK is achieved by slitting carbonized sheet-steel. Close tolerances are held and quantities produced exactly meet shop requirements. Thus, there is no high inventory of unusable material in the event of size changes or material obsolescence. Stock is classified as to quality of the black surface by colored cellophane tape around the coil

PRESSROOM AUTOMATICITY is evidenced by few operators for many presses. Stock feeds, straighteners, scrap cutters and precision dies keep presses running without constant attention

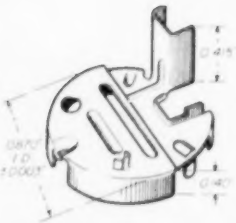


"WATCH FOR CRACKS" reminder cards on presses (above) tell operators what to look for in stamped parts. Without reading blueprints, operators check quality of work as it is produced. Height of embossings, width of tabs and other critcial points are noted on job cards

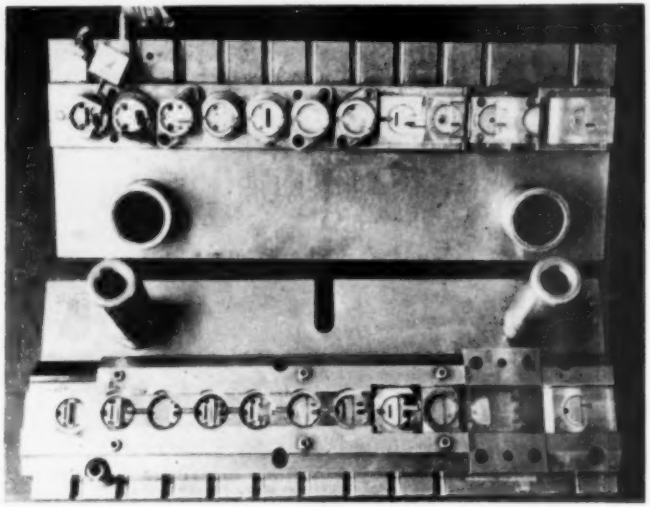
Versatile Press Tools Make Complex Tube Parts

Presswork on tube parts at Emporium is speeded by dies designed to produce two or more different parts merely by interchanging sections. Carbide is used lavishly for die inserts; die tolerances are held much closer than is usual. Because presses operate automatically, operators are free to make 10 or 20% checks against job process-control cards clipped to each press; no large final-inspection setup is necessary. Typical jobs and the dies that make them are shown on succeeding pages

• REMOVABLE PUNCHES, INSERTED DIES, PERMIT RAPID CHANGES IN RADIO-TUBE

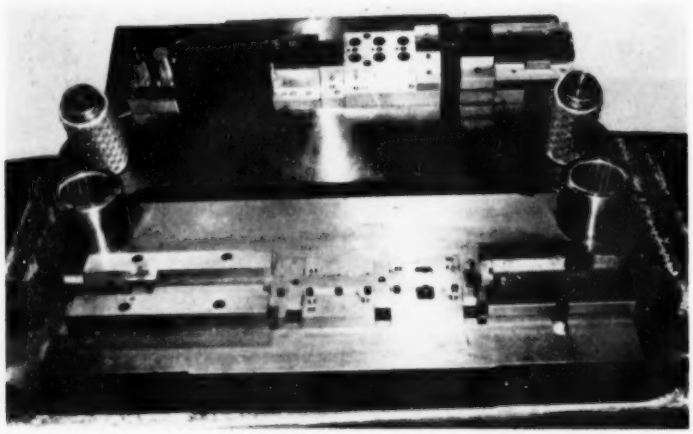


RIGHT-ANGLE "FLAG" makes this radio-tube collar a fabricating problem. Other collars are made in same die that produces this one, main difference being shape and number of holes and tabs. Material is 0.0065 in. plain crs

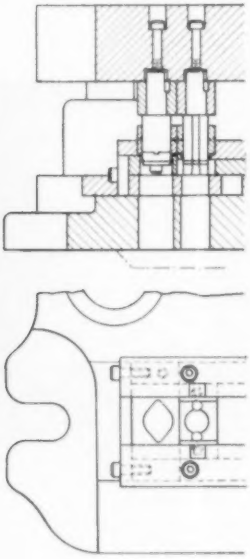


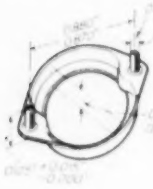
REMOVABLE PUNCHES and inserted dies make this progressive die a production tool for various collars. Highspeed production is facilitated by built-in air ejector

• INTEGRAL EYELETS DRAWN ON TUBE-BASE SOCKETS ABOLISH RIVETS, SAVE THOU-

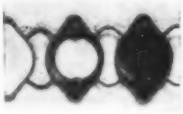


THIS DIE draws eyelets on a saddle that formerly required punched holes and rivets for assembly. Twelve working stations operate at 120 strokes per minute in a 35-ton press

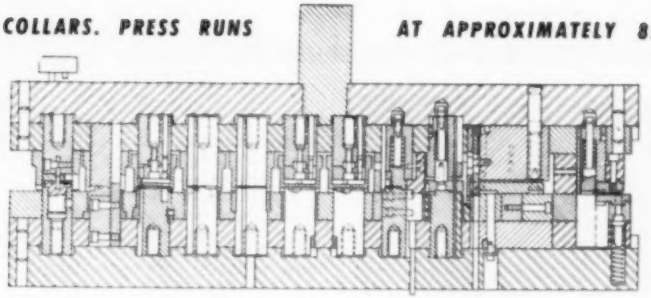




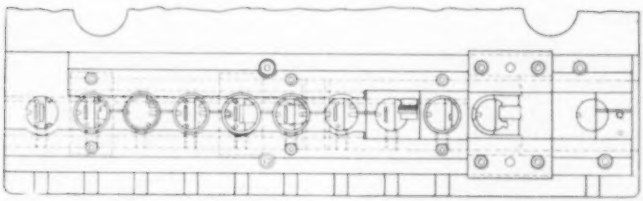
THIS SADDLE (left), crimped to plastic sockets, permits fast, tight, assembly. Trimming and blanking are the first two operations on 0.014 in. crs cadmium-plated strip (right). Cup is then drawn, wings are bent up to gather material for eyelets. Three draws are made, then eyelets are pierced, followed by a final draw and sizing. Center of cup is pierced and finished saddle blanked from strip



COLLARS. PRESS RUNS AT APPROXIMATELY 85 STROKES PER MINUTE

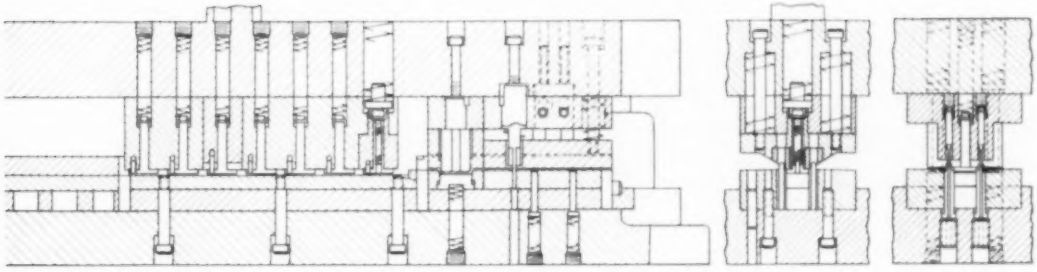


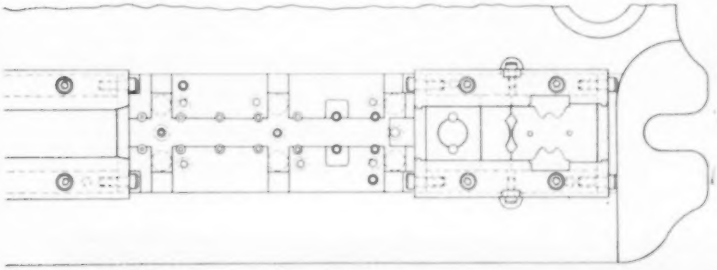
VERSATILITY was the aim in designing this die. By replacing punches and die inserts, tabs and holes are varied. Tool runs at 80 strokes per minute in a 20-ton press



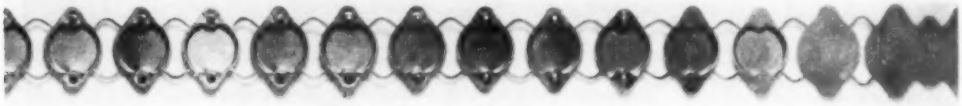
ELEVEN WORKING STATIONS are needed. First operation partially draws collar, second blanks contour on two sides, then the extension, or "flag" is produced. Body is drawn and flag is formed in the fourth station; in the next two, holes are pierced. In the seventh, an apron is started and the blank is lanced for eyelets, after which the eyelets are preformed. Tabs are then pierced and bend started. Tenth station finishes 90° bend of tabs and bends flag at right angles. Final operation is to blank part out of strip and form an apron.

SANDS OF DOLLARS ANNUALLY FROM ONE DIE DESIGN

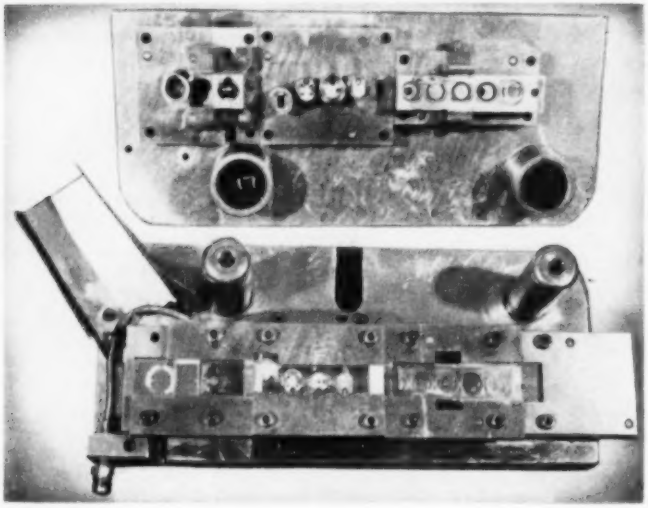




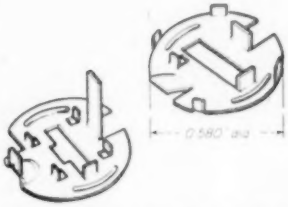
INTERCHANGEABLE DIE SECTIONS and open stations make this die flexible for production of different types of similar saddles for tube-base sockets. Spring-loaded pads keep strip flat and prevent damaging drawn eyelets and cupped body.



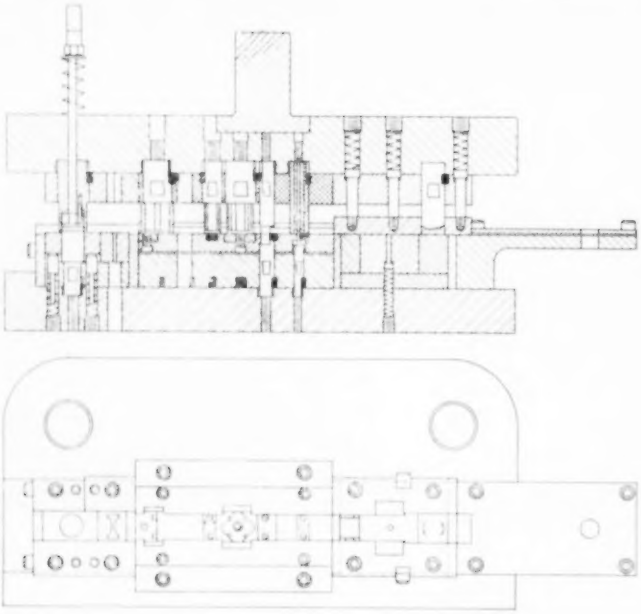
• INTERCHANGEABLE AND BLANK STATIONS MAKE TUBE-SHIELD DIE FLEXIBLE



DIFFERENT PARTS are made in this die by adding or replacing sectional stations. Setup shown has nine stations for making a radio-tube shield from 0.005-in. crs 1.000 in. wide. The die, in order, embosses curved ribs, notches strip for a french stop, blanks for a tab, embosses, and bends the tab at a 90° angle, shears and bends more tabs, pierces a rectangular hole, then blanks the shield from the strip



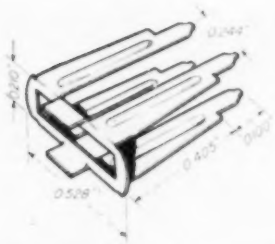
RADIO-TUBE MICA SHIELDS differ from each other in shape, number, and location of tabs. These and others are made in same die built to extremely close tolerances. Long automatic runs are made of each part with little or no die maintenance



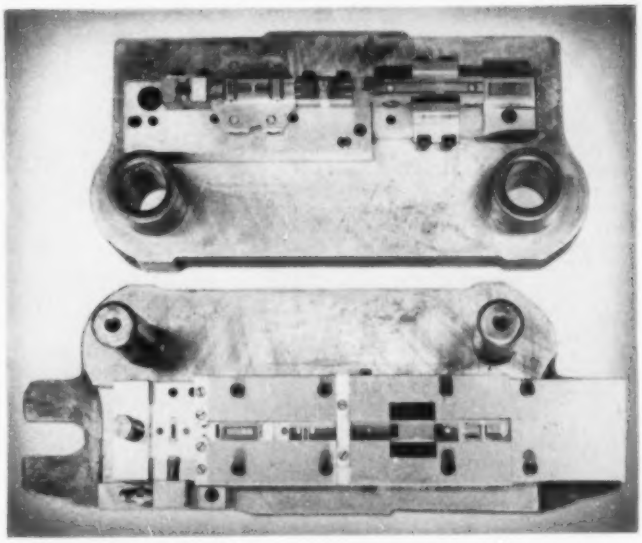
GOOD DIE CONSTRUCTION leaves space for extra stations so different shields can be made. All shearing, for tabs in shields, is done with "stripper-action" die inserts where punches depress hardened strippers ground to tab sizes. Die operates at 130 strokes per minute in 11-ton press

SEVERAL VARIETIES, one die . . . is typical of pressing operations. All dies are designed to produce as many different parts as is practical. Strip is made in 9-station die; other parts are made in same die with different inserts at several stations

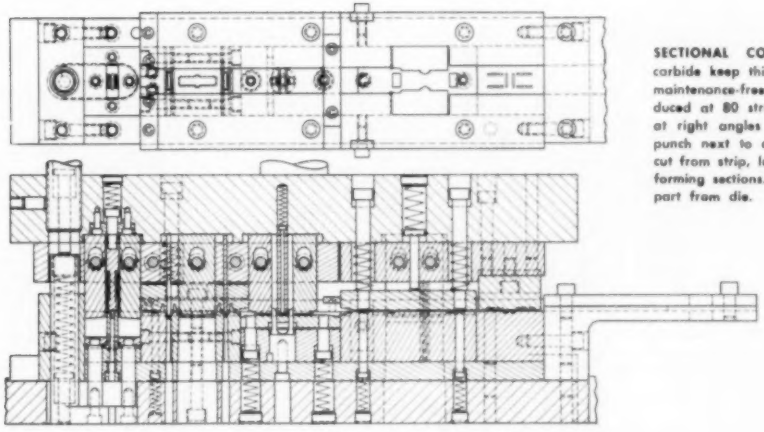
• $600 WORTH OF CARBIDE, CLOSE TOLERANCES, MAKE A TROUBLE-FREE DIE



RIGHT-ANGLE BENDS in two directions complicate production of this radio-tube beam-confining plate. All tabs are straightened within 0.005-in. tolerance after being bent at 90° angle. Material is 0.005-in. thick nickel-plated steel ⅝ in. wide, run in an 18-ton press at 80 strokes per minute



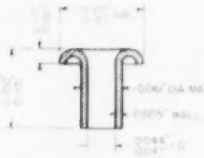
CARBIDE WORTH $600 is used in this die. Blanking die is solid carbide block 1½ in. wide by 1⅛ in. deep and 3 in. long. Contour was partially formed before final sintering, afterwards finish-ground with diamond wheel. Holes for lift pins that keep strip above blanking edges were made by electric-arc process after sintering die. Both solid carbide and brazed inserts are used for punches and dies in other stations.



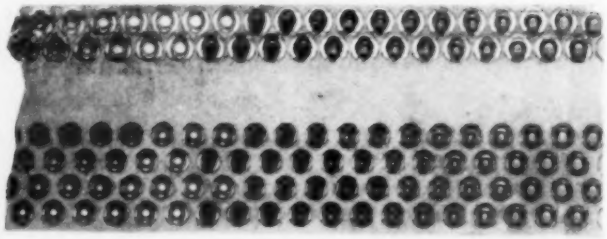
SECTIONAL CONSTRUCTION and lots of carbide keep this progressive die in steady, maintenance-free operation. Plates are produced at 80 strokes per minute. Tabs bent at right angles are straightened in upper punch next to cut-off station. After part is cut from strip, legs are bent around carbide forming sections. Air-blast ejector then strips part from die.

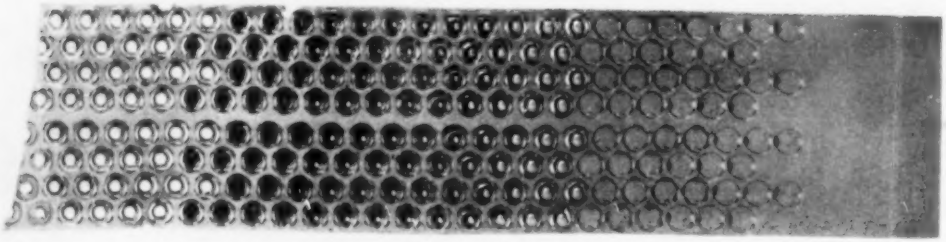
NICKEL-PLATED STRIP, 0.005 in. thick, ⅝ in. wide is embossed, trimmed, lanced (and tabs bent), pierced, straightened, cut off, and formed in the sequence shown here

• THOUSANDS OF EYELETS PER HOUR FORMED ON DIEING MACHINE

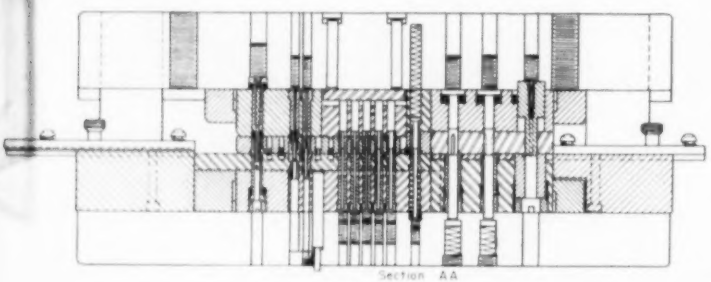


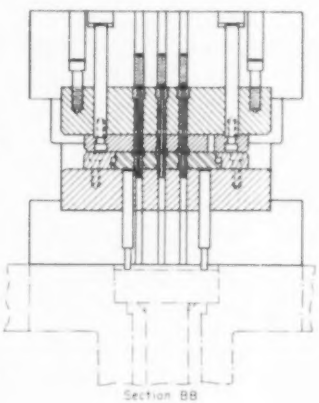
MILLIONS OF EYELETS go into radio parts. This typical one is formed from nickel-plated plain steel 0.0065 to 0.007 in. thick. Henry & Wright 35-ton dieing machine with versatile tools keeps production rate high. Some tools produce different-size eyelets from a single strip

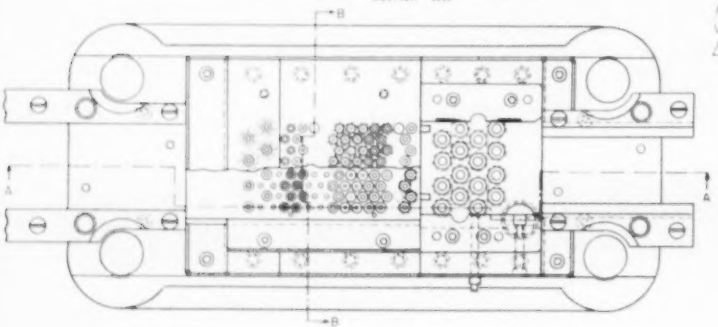




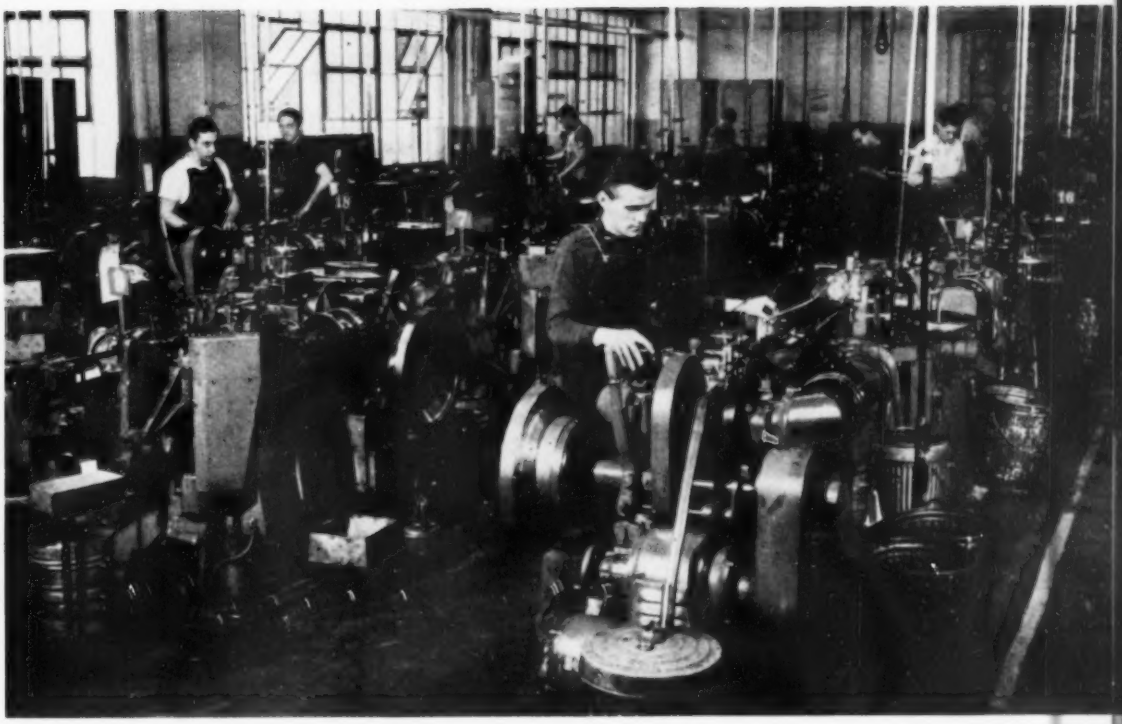
EIGHT EYELETS, with each press stroke, are made from lower strip. Stock is shallow-cupped in first station preparatory to first deep draw, lanced, and after a total of seven draws, cup is pierced. Final station blanks eyelets from strip. Upper strip has two different-size eyelets. Two of the larger, and four of the smaller, are made at each stroke







ELEVEN STATIONS, eight abreast, make eyelets at a rate of tens of thousands per hour. Carbide punches in carbide dies eliminate metal pick-up in operation and produce millions of parts before resharpening is necessary

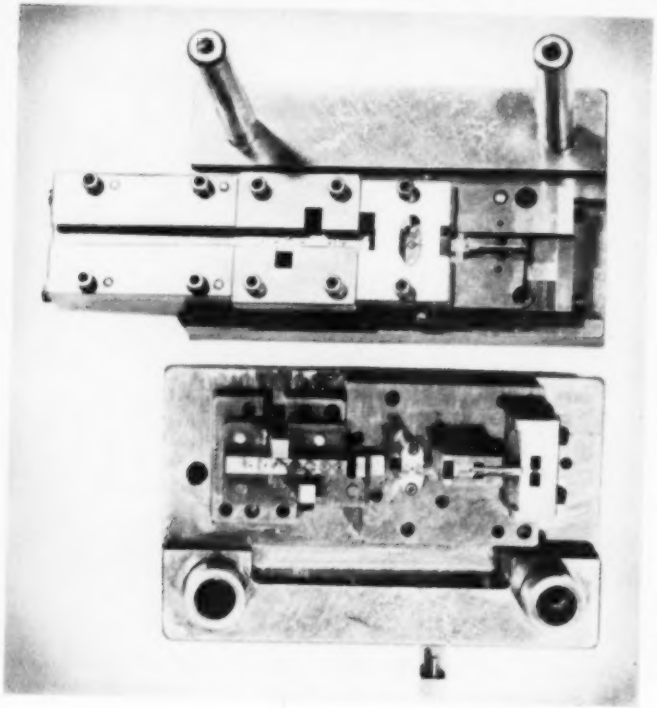


Multislides Make Tube and Contract Parts

THOUSANDS OF PIECES an hour are made in this #11 multislide being set up to run pure nickel strip. Material is 0.005 in. thick by 0.525 in. wide for radio-tube grids and shields. This is a new, small size in which Sylvania cooperated in the design

ALL TYPES AND SIZES of multislide machines run automatically at Emporium. Watch-band parts, radio-tube grids and shields, pushbutton levers, beam-confining plates and other parts with complicated bends or forms are made rapidly in these machines. Some parts are held to tolerances as tight as ±0.00025 in., most do not exceed ±0.001. Individual adjustments on multislides, not found on punch presses, decide choice of tooling for these machines rather than for press operations. Also somewhat simpler tooling is possible where side motions are needed for bending or forming. As in other departments, both Sylvania and contract parts are produced here. Some 50 multislide machines of several makes and the full range of sizes run in this department, producing parts of an equal range of sizes and complexity

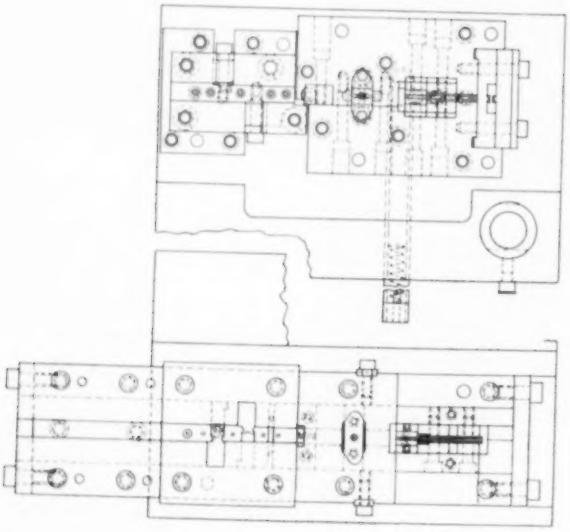
• 100 STAINLESS-STEEL SHELLS PRODUCED PER MINUTE



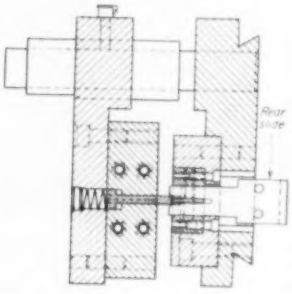
TINY WRISTWATCH BAND SHELLS . . . are made of 0.010 X 0.342-in. stainless steel. This part connects telescoping sections of band shown on facing page

PROGRESSIVE DIE in a multislide machine produces ladies wristwatch band parts without conventional forming tools. Running at 100 strokes per minute, this notching die makes center shells

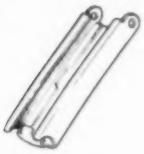
TWO SHELLS at each stroke are produced from stainless strip. First operation is to pierce pilot hole, then trim contour on one side of strip, at the same time notching for french stop. Opposite side is treated in same manner, after which resulting wings are depressed below centerline of shell. Four 0.023-in. dia holes are then pierced. Lips are formed at 90° angle to wings. Next operation is to bend wings down and finally cut off



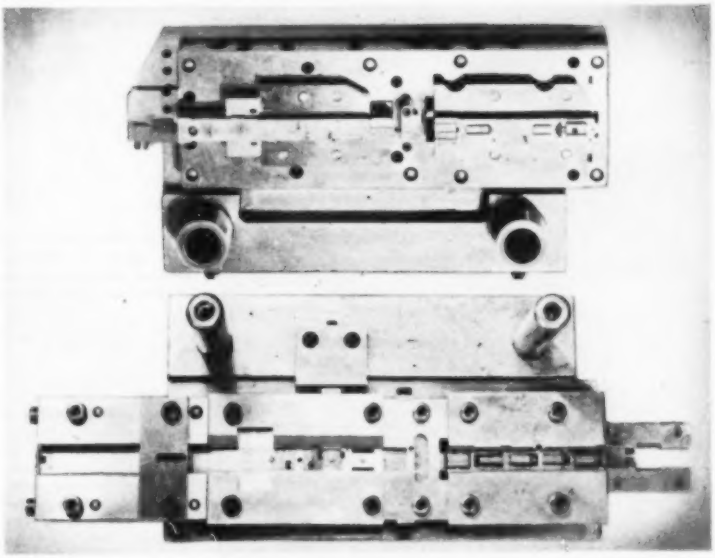
EIGHT WORKING STATIONS, with room for more, make this die useful for several different shell designs. Run in a multislide machine instead of a punch press, it makes use of the machine's rear slide for forming. At cutoff, blank remains in punch, is pushed back by next one until finally ejected at the rear



• SIMILAR DIES PRODUCE THE LONGER WATCH-BAND LINK

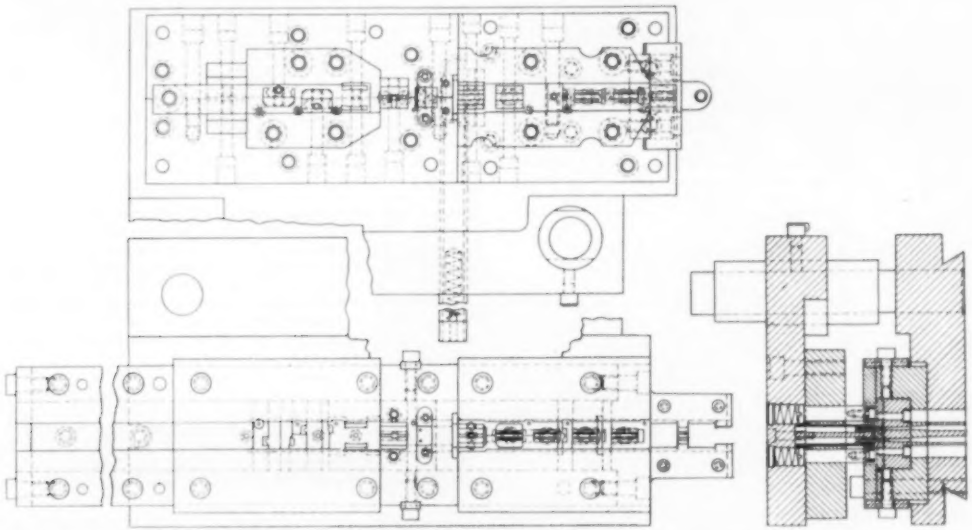


UNIFORM BANDS are needed in outer shells for telescoping wristwatch bands. This part is made of 0.008 X 0.525-in. stainless steel. A similar shell telescopes inside this one, with a tiny spring between to give band flexibility



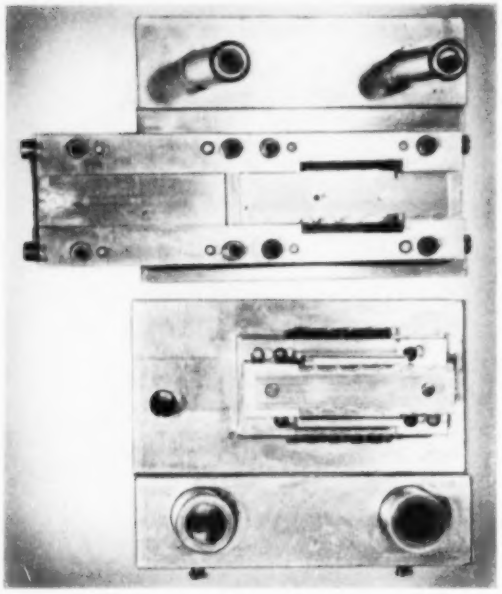
SECTIONAL, GROUND INSERTS make up this multislide die. Eleven stations are used to make outer shells for wristwatch bands

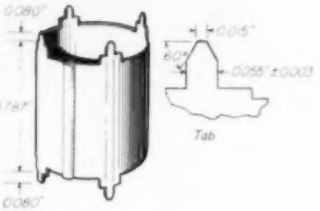
STRIP IS RUN at 100 strokes per minute to produce outer shells. Blanking, trimming, forming, piercing, and bending are included in 11 operations performed



HIGH PRODUCTION, high quality, result from well-designed, well-built tools. This die accurately produces a uniform product because ground sections are made to tolerances far closer than required in the part

• SHIELD WITH LUGS BLANKED AND FORMED AT 125 STROKES PER MINUTE

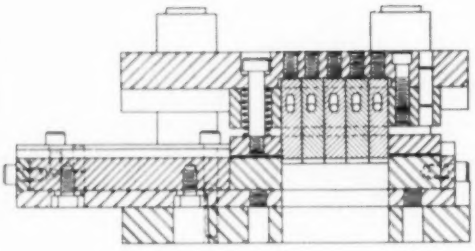


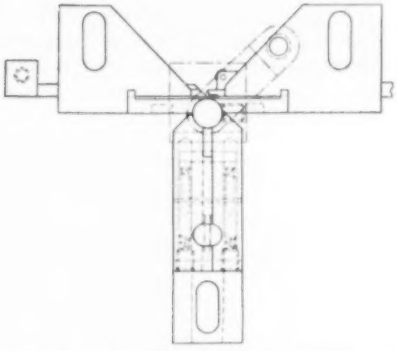


ROLLED FORM with lockseam is the final shape of radio-tube outer shields after notching contour and forming in a multislide machine. Material is dead-soft steel, 0.005 in. thick, and is run at rates from 100 to 150 strokes per minute, depending upon part

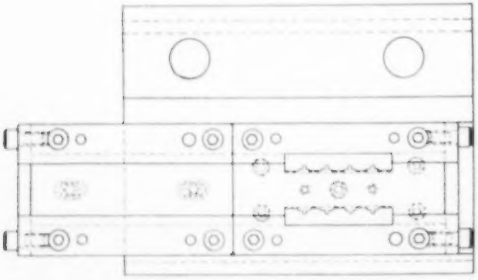
◀

SOLID CARBIDE SECTION ⅝x1¾x4 in. notches contour of radio-tube outer shield in this multi-slide die before strip reaches forming tools. Lift-pin holes were made in unsintered, or "green," carbide blank with generous location tolerances to simplify this operation. Soft-steel plugs, inserted later, were drilled to close tolerances by Sylvania and lift pins assembled. Die contour is ground with diamond wheel, as is brazed carbide cutting edge of upper punch





CUT-OFF AND FORM follows notching of radio-tube outer shields in multislide. After cutoff and stock advance the front slide brings forming tool in to form strip against arbor, while the rear slide provides support in back. Right and left slides simultaneously enter to complete rounding, and to form flanges, one longer than the other, for seam. Left tool partially withdraws while rear tool laps one flange over the other, then recedes. Left seaming tool reenters to compress seam, then withdraws while right tool bends seam. Piece is complete after rear tool flattens seam and withdraws

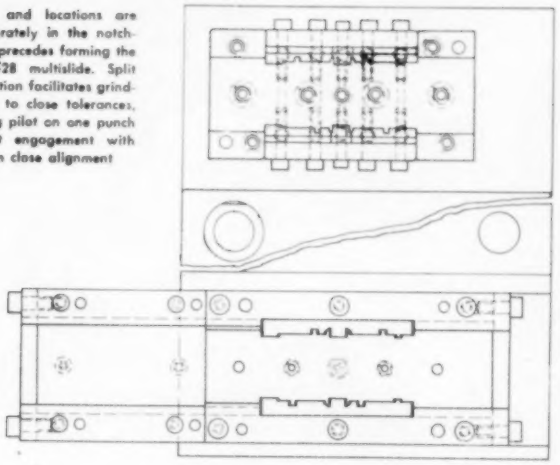


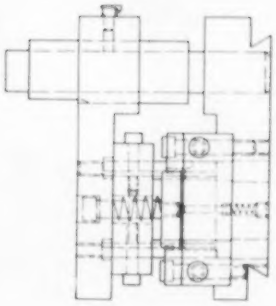
RUGGED DIE CONSTRUCTION is typical of multislide tools. This notching die for outer shields is built for long runs, high production. Spring-loaded stripper keeps stock tight and flat against die, lift pins prevent sticking for fast stock feed

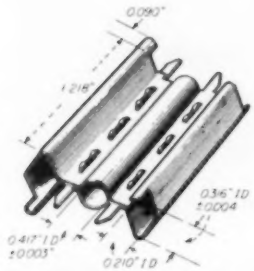
TIGHT TOLERANCES are held between pointed tabs of this outer shield strip in notching contour. Center-to-center distance is held within 0.0005 in. Same tolerance applies between tabs at each end

• RADIO-TUBE PLATES ARE MORE COMPLEX, BUT SIMILARLY MADE

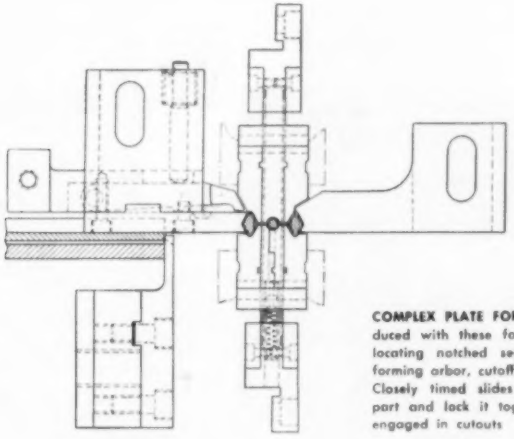
TAB SHAPES and locations are produced accurately in the notching die which precedes forming the plate in a 528 multislide. Split punch construction facilitates grinding tab forms to close tolerances, and extra long pilot on one punch is in constant engagement with die to maintain close alignment







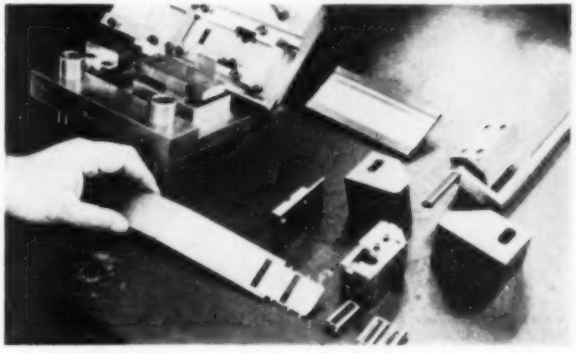
RADIO-TUBE PLATES are a natural for multislide machine work. This one is produced at 50 strokes per minute. Note in cross-section at right how ends are overlapped to avoid springing



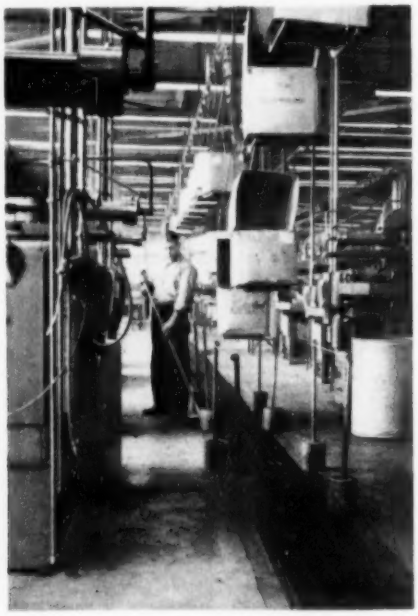
COMPLEX PLATE FORM is quickly produced with these forming tools. After locating notched section of strip on forming arbor, cutoff blade parts strip. Closely timed slides operate to form part and lock it together with stakes engaged in cutouts

PROPER DIE DESIGN AVOIDS NEED FOR WELDED ASSEMBLY

TWO WELDED PARTS are eliminated by making radio-tube beam-confining plates in a multi-slide machine. At 50 strokes per minute, nickel-plated steel strip, 0.0065 in. thick, is ribbed, embossed, blanked, then notched for contour. Before cutoff is complete, work is located on forming arbor where front tool advances to start two 90° bends when the work is parted from the strip. Opposing side tools complete bends and make two more 90° bends around back of the arbor by a wiping action. Stripper removes finished plate and ejects it into a production box



QUALITY CONTROL is maintained by vacuum tests on closures, vibration and dielectric testing of tube sockets, and the pressing and baking of various materials. For example, vibration tests range from zero to 0.2 in. amplitude at 10 to 55 cps frequency automatically varied. Dielectric breakdown runs zero to 15,000 volts ac for government tube specifications. "Q" meter measures resistance of plastic between contact pins in tube base. Other tests on parts and materials insure uninterrupted and automatic high-quality production



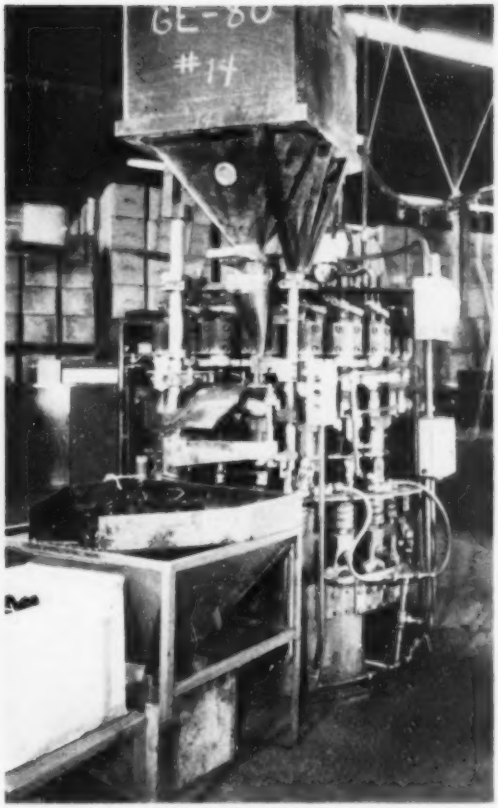
MATERIALS-HANDLING is simplified by overhead conveyor that carries boxes of parts from automatic compression-molding machines to tumbling. Floor grid covers chain conveyor into which scrap from machines is swept. Underfloor circuit passes through molding department and carries scrap out to an overhead hopper

Mechanization
+ Control
= High-Quality

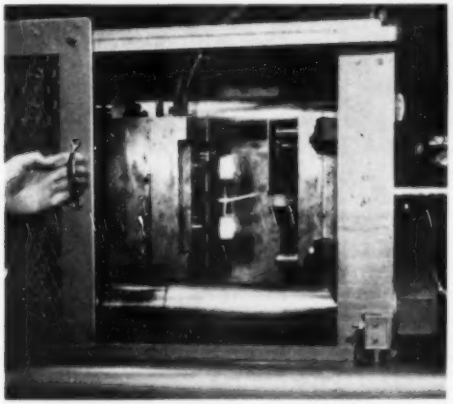
Mechanized plastics department at Warren has completely automatic compression and injection molding machines, as well as conveyorized materials handling. An overhead conveyor carries finished parts from compression-molding machines to tumbling facilities, while, underfoot, a grid-covered chain conveyor takes scrap to outdoor hoppers from which it is trucked away periodically.

Only a few men are needed to handle 28 continuously operating compression-molding machines ranging in capacity from 15 to 150 tons. The first automatic injection-molding machine runs unattended except for the removal of loaded production boxes.

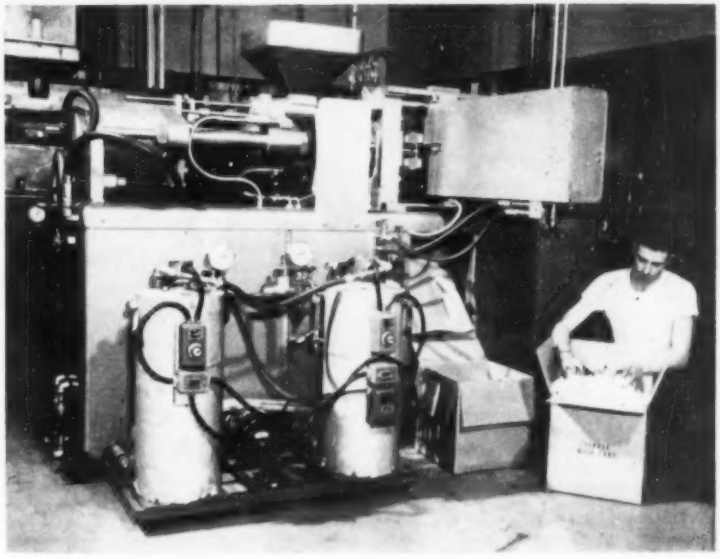
Close laboratory control is maintained over material and part specifications. Fully equipped for a wide range of tests, the lab insures high-quality production of tube bases, sockets, closures, spout caps and other diversified parts



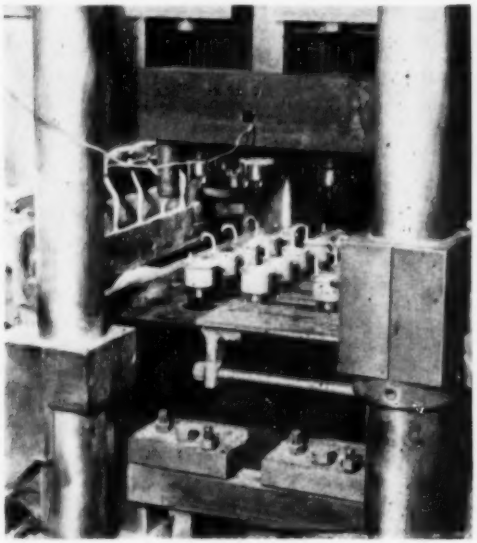
ONE TUBE BASE every two seconds is made in 20-station Cropp rotary compression-molding machines. Three tons pressure is applied on each station for molding phenolic-resin tube bases with 40-sec curing time. Twenty cavities are gas fired (about 350F) as they rotate around machine, part being ejected at front where empty cavity is reloaded with powder. An air blast removes flash after the compression stroke, just as the part starts into the heating zone. Heating cycle is adjustable through variable-speed drive, and solenoid valves control temperature



FLUORESCENT-LAMP END CAPS are made two at a time by automatic injection molding. Microswitches control hydraulically operated stripper comb which moves in after mold is nearly finished opening. When molded parts on knockout pins continue moving, work is stripped against comb, removing sprue, gate and runner. Comb plate then backs away and mold closes for new injection

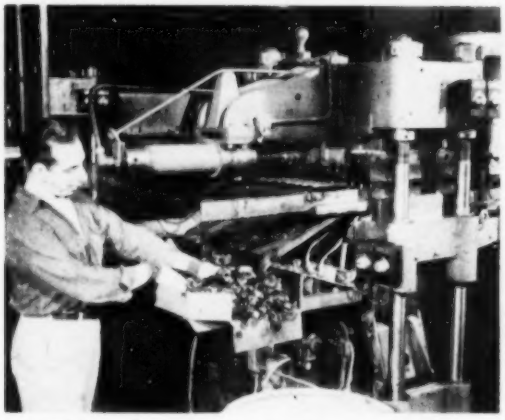


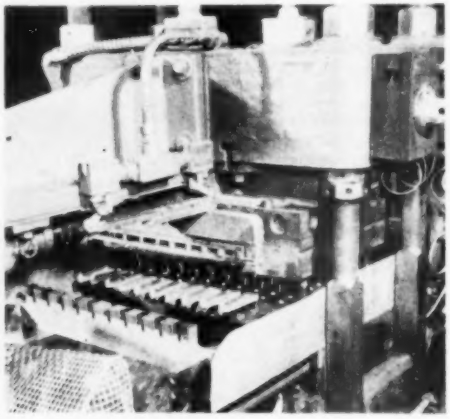
TAKING 'EM AWAY is all that's required in running this 4-oz injection-molding machine. Fully automatic, it produces 180 polystyrene end caps an hour with a 40-sec cycle



CONTINUOUS, UNATTENDED PRODUCTION of radio-tube bases is accomplished by a 20-cavity mold in a Stokes 50-ton automatic compression-molding machine. Opening and closing strokes are microswitch controlled to operate in sequence with combination stripper comb and powder fill box. With a 3-minute cycle, nearly 10,000 low-loss phenolic bases are made in 24 hours

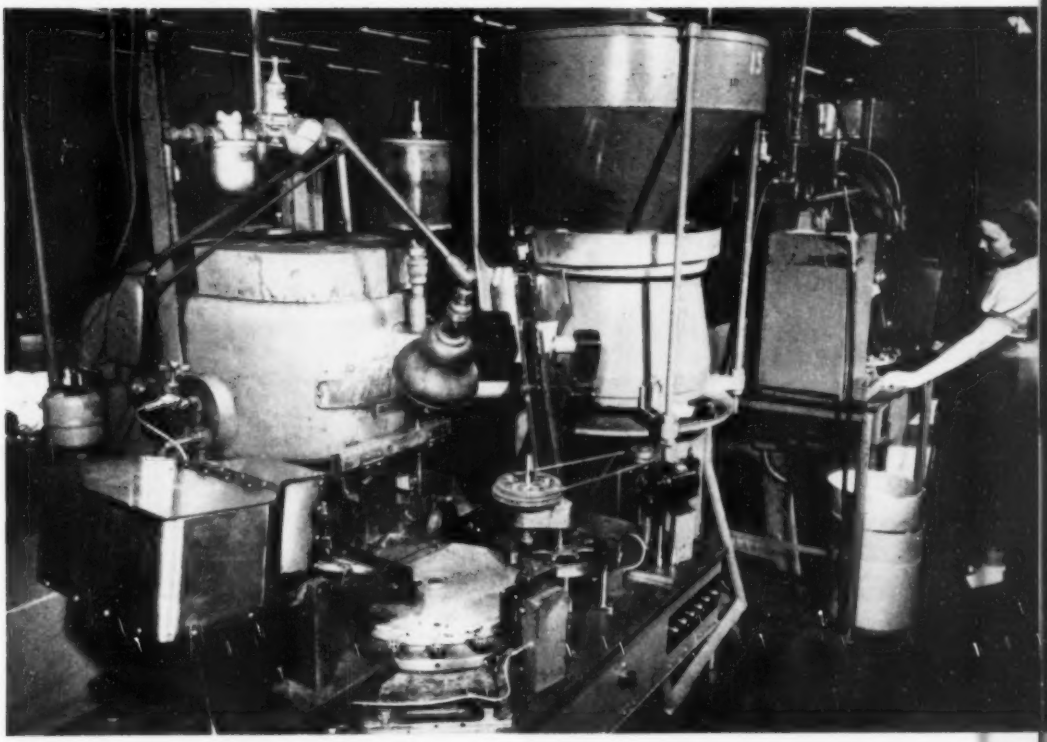
ELECTRICITY AND AIR speed production of turret-lamp-holder caps in this 15-ton compression-molding machine. Three-cavity mold is opened and closed electrically, air blast ejects molded caps, and air-operated powder feed loads mold. Cycle time is approximately 1½ minutes. When cartons into which molded parts are ejected are full, they are loaded on an overhead conveyor and carried to tumbling facilities. Only occasional checks are made to insure constant, trouble-free automatic operation of these machines





BETWEEN 40,000 AND 100,000 PARTS a day are molded in automatic compression-molding machine, depending upon number of mold cavities. Closures, shown being removed from this 150-ton Stokes press, are made from preforms automatically loaded into mold from a hopper. Hydraulic cylinder actuates a comb for stripping parts from the mold and carrying them to a tray from which they are swept into a drum

SPOUT CAPS for lighter-fluid containers are made in a 90-cavity mold. Here a 50-ton Stokes press, automatically fed with preforms, runs unattended on a 1½ minute cycle. Material is phenolic resin



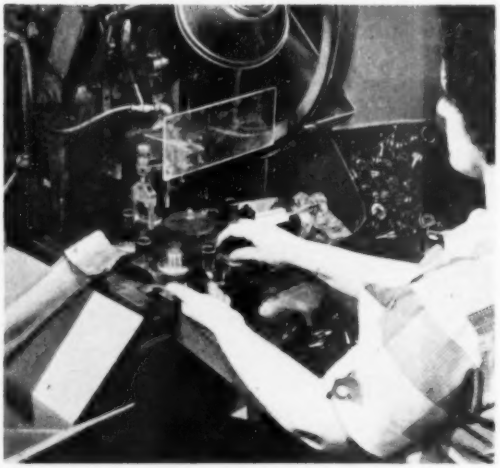
ONE GIRL tends two machines staking pins to radio-tube bases. Operator only makes occasional adjustments when needed because pins and bases are automatically fed to machine, positioned, staked, and finished parts ejected. Large Syntron vibrator shakes bases from hopper into feed track for delivery to 9-cavity indexing table. Electric eye on this track momentarily stops vibration, and thus feed, when track is fully loaded. At the opposite side of the machine, a rocking hopper feeds pins into dies in an 18-station indexing table. Feed track for pins is sectioned so that fewer than 8 pins may be loaded in each die by merely closing off desired chutes. Dies rotate around to position under the 9-cavity table where a rotating plunger drives bases into aligned engagement with pins. Next stop is under multipress ram where one of two punches splits pin ends and the other stakes. Pickup arm and air blast ejector drops work onto conveyor at rear of machine for inspection. Production rate is about 75 pieces a minute. An interesting control is a terminal block between the pin hopper and the base-indexing table. Dies loaded with pins engage this block; it breaks circuit to stop the assembling plunger if a pin is missing. If four consecutive dies have missing pins, machine shuts down

Fast Automatic Machines Assemble Plastics and Metal

Metal parts, such as wire, rings, and contact pins, are speedily assembled in plastic tube bases and sockets by means of specially developed automatic machines that need a minimum of attention. Here, too, quality control is important and inspection is mechanized to keep up with the high output of the machines. A conveyor, for example, runs behind a bank of staking machines to pick up radio-tube bases in which contact pins are assembled. One inspector for each two machines checks finished parts as they come through on the conveyor. In another setup, one inspector checks parts coming to her on a conveyor from three machines that automatically assemble liners in bottle caps ("closures")

CONVEYORIZED ASSEMBLY and inspection speeds closure manufacture. Here three machines automatically assemble liners in bottle caps, each at a production rate of 10,000 per hour. Each machine has a dial feed table into which caps are hopper fed, cavity side up, for feeding to large sectioned conveyor. Sections indicate to inspector making visual check which machine parts come from. Conveyor belt goes around pulley and caps turn over as they enter smaller sectioned conveyor for visual inspection of tops for impact cracks or other defects.

ASSEMBLING AND WELDING is fast and accurate in this specially designed machine. Stainless-steel rings are assembled to tube bases having contact pins and a lead wire is passed through and welded to one pin. Rings with lockseams are loaded in one cavity of a 12-station indexing table and bases are loaded into next adjoining cavity. Rotating plunger turns ring to position lockseam relative to groove in the base, and by means of a key-way engaged in the base key, positions the assembly so the proper pin is located for wire welding. Overhead spool at welding head feeds nickel wire through pin and spotwelder under table joins end to inside of ring. In one 8-hour shift, about 12,000 bases are assembled in this manner.

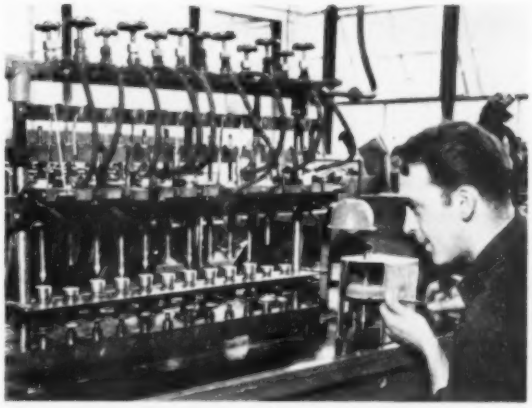


HIGH-SPEED INSPECTION of staked tube bases is accomplished in a bench press with 6-station dial feed. Bases are loaded on tapered dies and carried to ram where a spring-loaded hollow punch applies a 30-lb force. Punch has an arm that contacts a microswitch if spring is compressed beyond predetermined load. Microswitch closes signal-light circuit to flash warning to operator that a part has broken under load. A pickoff arm takes bases from the dies after inspection and an air blast ejects them into a production box. About 2000 parts are inspected per hour.

ADVANCED INSPECTION EQUIPMENT includes balances for determining size of very fine wire, (0.002-in. dia) by weight in milligrams. Tensile testers check strength, and conductivity tests are made on bi-metal wire to determine material proportions

Mechanized Wire Working Is Under Close Quality Control

A variety of materials is used for wire in lamps and tubes. Wire is drawn from ⅜ in. down to 0.002 in. dia, most common sizes being 0.040, 0.010 and 0.002 in. Plain steel wire is plated to conserve critically short nickel, and for high-temperature applications nickel-clad copper is worked to provide wire with high conductivity and resistance to corrosion. Stainless steel, copper, and other materials are drawn, too, in highly mechanized equipment, all production being subject to close quality control. An inspection station in the wire-drawing department is fully equipped to analyze physical and electrical properties as well as to check wire sizes

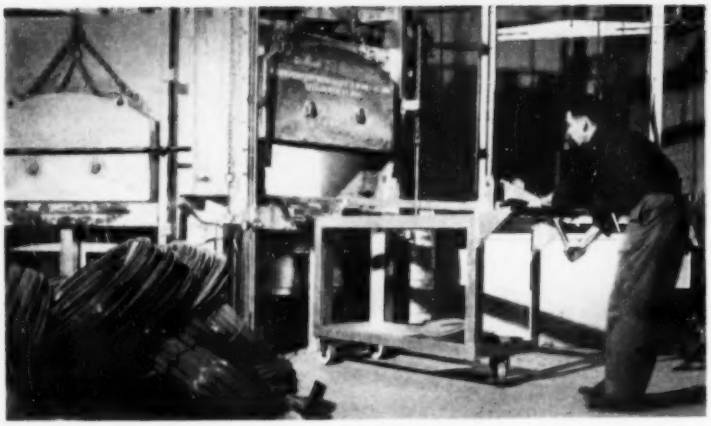


DIAMOND DIES are resized with sewing needles, olive oil, and diamond dust (sifted to desired size) in individually reciprocating heads of this machine. It differs from others in that air vibrates the needle. Elastic straps attached to needle-support bar eliminate shock in reciprocation. Wire-drawing dies 10 circular mils and smaller are held to tolerances based on 2 to 4% of weight of standard length (200 mm) of wire. Above 10 mils, tolerances are ±0.0003 in., with 0.015-in.-dia dies being held to ±0.0002 in. Diamond dies with electrolytically produced holes are brought up to next wire-drawing size in these machines when hole wears out of tolerances. Machines size approximately 18 dies in an 8-hour day

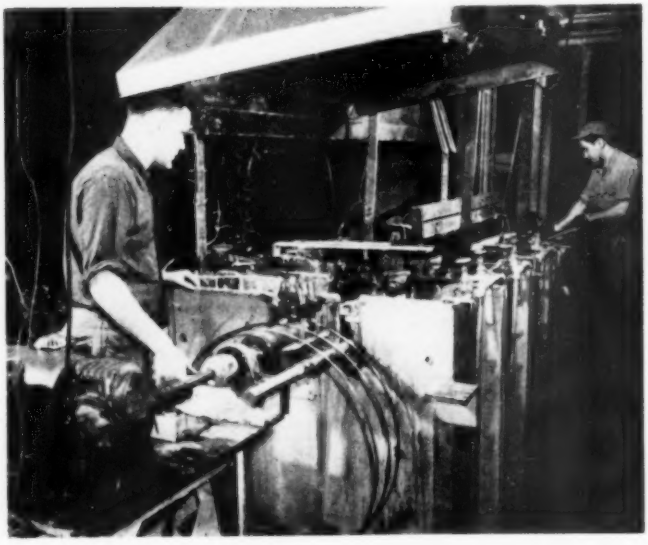
MECHANIZED WIRE WORKING

continued

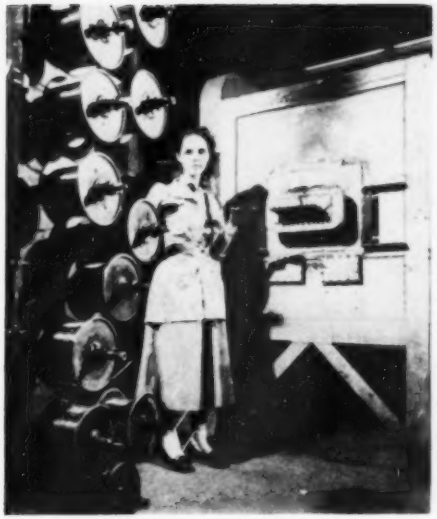
"BIG BERTHA" draws ¼-in. wire down to 0.100 in. at rate of 1000 lb per hour, depending on material. This Vaughn machine has five drawing capstans, the first (at far end) of which is double. Wire passes from each capstan through rheostat dancer arms that control the speed of the capstan changed by wire reduction and to prevent slippage of the wire on the capstan



ANNEALING STAINLESS between draws is done in this gas-fired rotary-hearth furnace which can handle 3000 lb of wire an hour. Depending on size, wire is kept in furnace up to 75 min. Temperature is 1950F and immediate quench keeps carbide in solution. Large coils are easily handled with portable lever-lift. Heated coils are swung to quench tank at right into which an air-cylinder-lifted cage plunges them

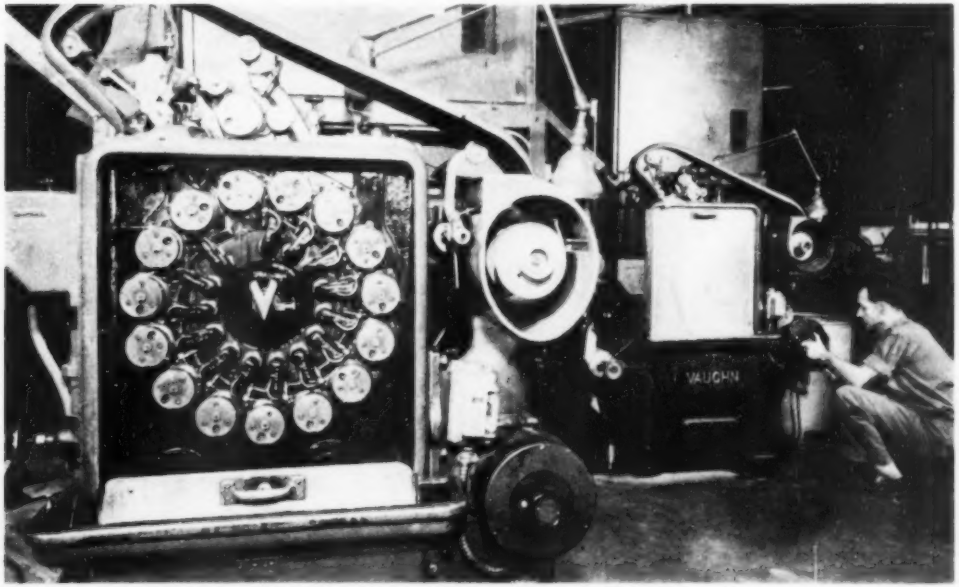


WIRE IS NICKEL-PLATED continuously by feeding it as a horizontal helix through a 13-ft series of tanks. Coils of ¼-in. wire from mill are butt-welded together, the bead ground to size, and then loaded on reels (far left) for passage to straightening rolls and coiling rolls (center bottom). Rolls feed wire in 30-in.-dia coils to rubber-covered 6-in.-dia roll the full length. Variable speed drives, one for straightening and helixing rolls, and another to drive the tank rolls, control plating rate, because 5000-amp current remains constant. Pins flanking the tank roll guide the wire, and tank partitions have a notch and offset to pass the coil. Plating thicknesses range from 2 to 8% by weight of wire, and wire feed speeds range from 10 fpm for 8% plate to 40 fpm. Wire is coiled on reel ready for delivery as it leaves the last bath. Production rate ranges from 50,000 to 150,000 lb of wire per month, depending upon plating thicknesses

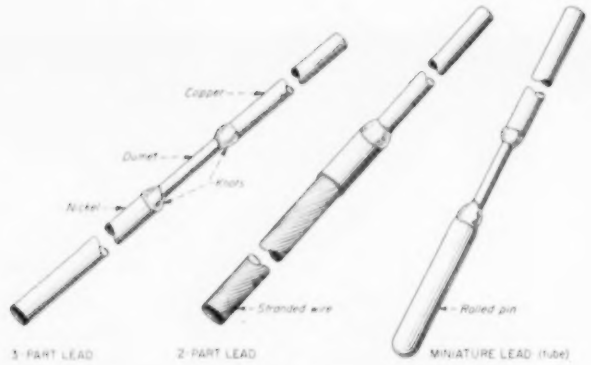


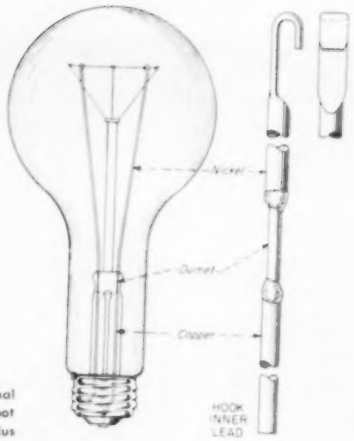
STRAND ANNEALING for physical properties is important in working 0.010-in.-dia nickel-clad copper wire. Two racks unwind wire into individual tubes through electric furnace with hydrogen atmosphere and 1560 F temperature

ANNEALED STRANDS are pulled through furnace from racks to 10 reels on each of three tables at opposite end of furnace, (right). Variable-speed drives operate through gear reducers to turn a pulley shaft. Rubber-covered pulleys on shaft contact wire on spool for friction drive to maintain constant speed through furnace as wire on spools increases diameter. Traversing heads in front of each spool are worm-driven from pulley shaft and oscillate to wind wire across face of spool. Rewinding, when necessary, is easily accomplished by raising a swivel-mounted spool from contact with the rubber pulley on one side and letting wire wind onto a pulley-driven spool across the table



SMALLER WIRE SIZES, 0.010 to 0.002 in. dia, are drawn in these high-speed machines. Generally wire is drawn on larger machines from 0.100 in dia to 0.050, then annealed, drawn again from 0.050 to 0.010, annealed, and then drawn down to 0.002 in. It enters from left, goes around a driving capstan, through a die, and onto next capstan, which runs faster because of increasing length

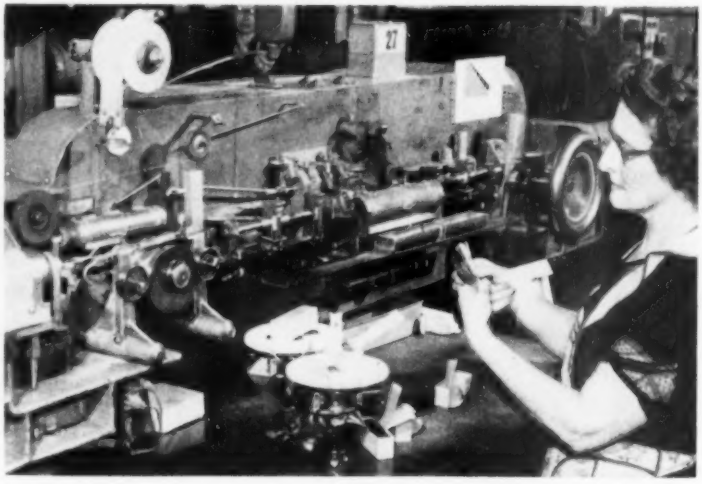




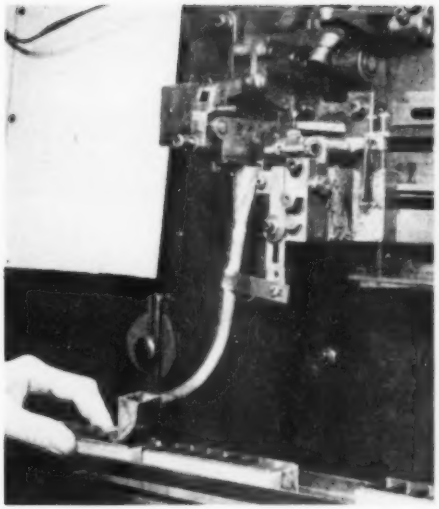
MANY DIFFERENT sizes of leads are made for various purposes. Dumet wire has same thermal coefficient of expansion as soft glass, therefore is used as a sealing metal. Size of spot welds is closely controlled by cam timing as "knots" must not exceed wire diameters plus specified dimension. Straightness is measured by a camber gage 0.005 in. larger than lead within 3 mm of knots

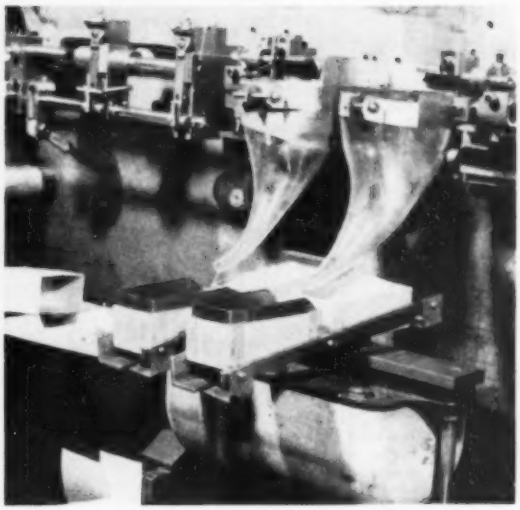
Wire Leads Welded, Formed, Pins Rolled Automatically in Special Machines

IN line with Sylvania's program of complete mechanization, the welding of aligned wire of various materials for leads in electronic tubes, incandescent lamps and other glass-metal combinations is completely automatic. . . . Wire "tails" are welded at right angles to stainless-steel cups, in fast, special machines. Another special setup is a "pin roller" in which soft wire is automatically cut off, rolled, and formed in carbide dies to make contact pins for radio tubes and terminals for hermetic seals. Close quality control is exercised over all operations, the Bausch & Lomb Metallograph shown on page 113 being a recent addition to equipment.

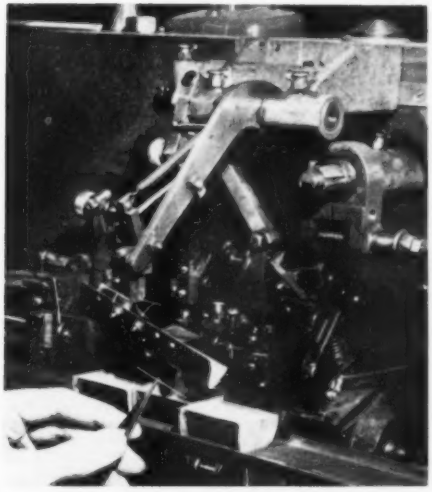


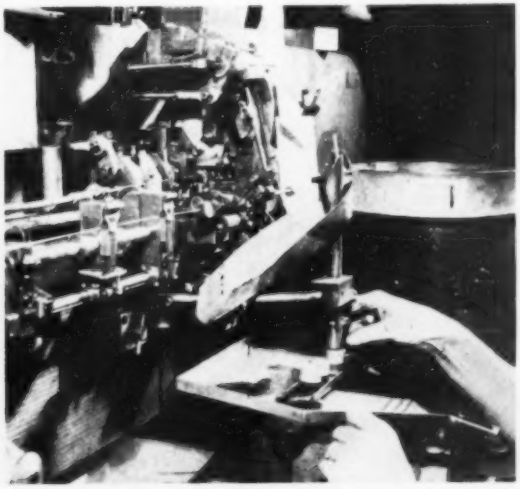
LEADS FOR LIGHTING and electronics are made automatically by joining, in alignment, wire of different materials in special lead-welding machines like this one. A 3 part lead, for example, is made by feeding nickel (or stainless) wire from the left, copper from the right and butt welding "Dumet" (nickel-iron core, copper clad and borax coated) wire between the two. Dumet is cut to length and brought down from above for the double weld. Average production rate is 180 leads per minute, sometimes runs as high as 250 per minute depending on type of material being run. Machines are readily convertible for changes in wire length or combinations. All motions are cam-actuated from the back of the vertical base casting





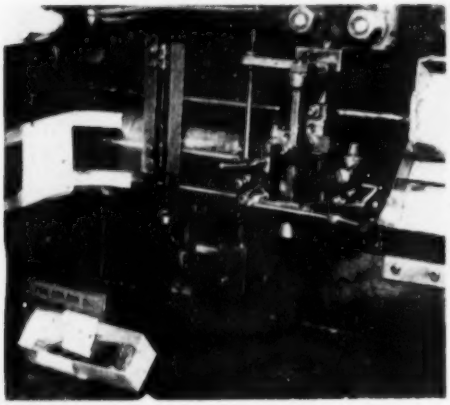
TAILOR-MADE EJECTION CHUTES handle the many shapes of lead wires. At left is a rough model for short leads which can be stacked either way, as long as they are parallel. They pass down the tube into a collecting box, which ejects them, somewhat as kitchen matches are dispensed, against a guide plate leading into a box. . . . The twin units of transparent plastic at far right handle longer flat-end radio-tube support wires, feeding them directly and all the same way, against U-shaped striker plates in boxes. A Syntron vibrator unit under the box support arms prevents pileups at box centers, assures maintenance of alignment. Here only shearing units of a stripped-down welder are used, purely for cutting wires to length at about 200 strokes per minute



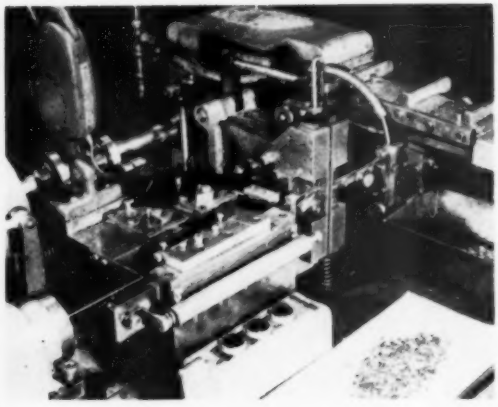


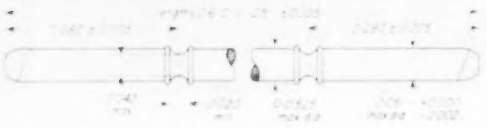
EJECTION DEVICES for welders must be positive, yet delicate, because wires must not be bent. This one, for example, has an arm with clamp on the end that grips the assembled lead wire and carries it out to two bent wires (position shown), which guide it into a chute from which it slides into a semi-cylindrical metal box, permitting the operator to make easy visual inspection of the group. This unit handles 180 assemblies per minute

SHORT LEADS are welded to rolled pins in this welder, the pins being lifted in the Syntron vibrator at right, then shot by air through a tube into welding position. Welded assemblies are picked off by an arm and carried to a knockoff wire over a vertical tube. The heavy pin end drops down first and leads go into a cylindrical box in that position. Another Syntron vibrator under the boxes joggles the leads so boxes can be filled to keep leads upright. Bent or otherwise imperfect assemblies fall outside the vertical chute, are carried to box at left



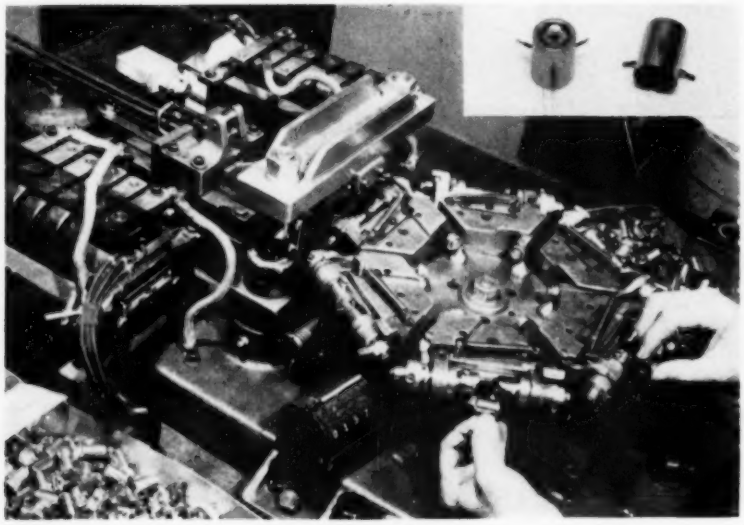
FILAMENT SUPPORT WIRES (usually nickel) are flattened and hooked at ends in this press. Welded lead-wire assemblies are placed in a feed box at left. This is continuously vibrated to drop the bottom one through a slot, from which a belt carries it to a 4-tube rotary carrier. First carrier position is for loading, second (bottom) for flattening, third for bending hook, and fourth for ejection. Cams operated by the ram control indexing and operate air jets and vacuum units for wire feed. Rate is 165 per min. One welding machine has already been equipped with an integral hook-forming unit



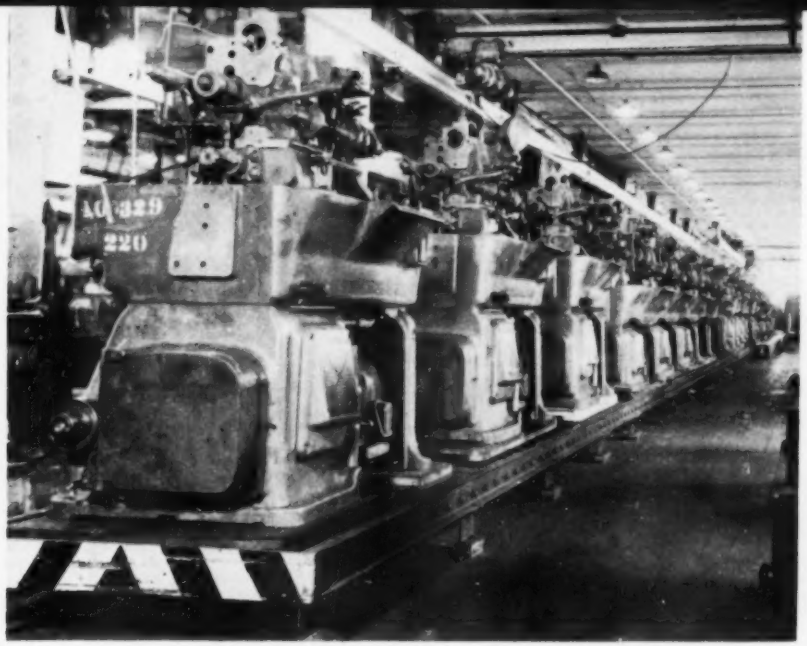


PIN ROLLER makes radio-tube contact pins from soft wire at 500 per minute. Employee suggestions increased production from 300 per minute. Wire is fed through rotary straightener, then through cam-operated grip and feed, from which it passes to a cut-off station where pins are cut to length. From here pins are injected, by an air blast, into carbide dies made up of a lower plate with ground raised strips for forming undercuts and a flat upper plate for rounding. Confining walls in lower plate chamfer both ends of pins.

Radio-tube contact pins are 9/32 in. to 1⅛ in. long and from 0.070 to 0.040 in. in dia. Materials include nickel-plated copperweld, nickel-plated steel and pure nickel wire. For special radio applications, an alloy consisting of 42% nickel, 6% chrome, balance iron, is used. Two grooves in this particular pin shape make tight glass-to-metal seal in tubes because glass flows into them. Pins are handled in surplus ammunition boxes, painted in colors to identify material and shape



"TAILS," welded at right angles to axis of stainless-steel cups and exactly 120° apart, are made of 0.030-in.-dia wire fed to swaging (outer end flattened) and cut-off die at welding head. Cups are loaded in automatically clamping work fixtures on 6-station indexing table and carried to welding head. Here work fixture indexes 3 times while taps, or "tails", are butt-welded to cup body. Part is used on electron gun in cathode-ray tube

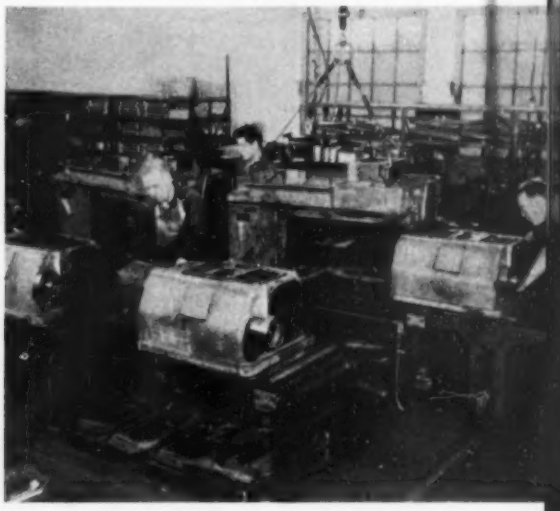


Automatics roll off the line...

For the first time, machine-tool assembly has been fully conveyorized. Brown & Sharpe is putting together the OOG, OG, and 2G automatic screw machines on a twin roller-conveyor setup—one for the smallest size, the OOG, and the other for the OG and 2G. Here is the story—in pictures of key operations. Because available buildings are multi-storied, the conveyor is actually three conveyors, each on a different floor. Careful scheduling and control have resulted in smooth production flow and sustained high quality

By E J TANGERMAN
EXECUTIVE EDITOR

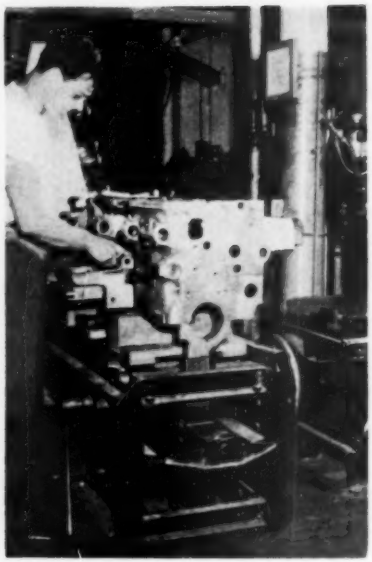
BASE (right), **LEG** (left foreground), and **TANK** (just above leg) are assembled on the same conveyor. Machined castings start in foreground, progress to back. Gearing subassemblies for base are in cabinet at right, electrical parts at left, other parts in boxes or on vertical rods. Parts are fitted and mated, then identified. Electrical elements are installed on leg at center left



BASE AND TANK ARE ASSEMBLED at the conveyor end, by transferring the assembled base on a section of conveyor or tracks. It is located by latches on the side of the conveyor. Switch compartment and leg are already bolted under the tank at rear, and base is being rolled in on its pallet

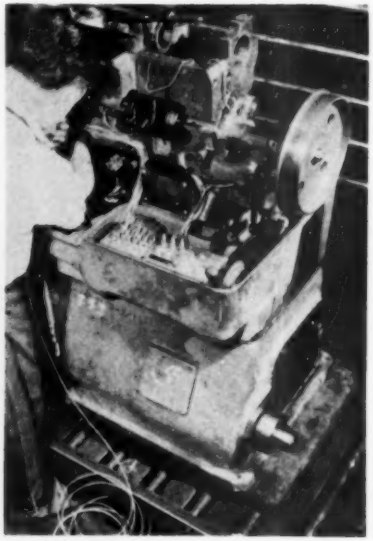
PLEASE TURN PAGE

BEDS ARE ASSEMBLED on a separate conveyor on another floor. Spindle housing and cross slides must be scraped before beds are placed on the line. Conveyors are in a multi-story building, with base, bed, and final lines on different floors. Various models are handled on the same line by grouping

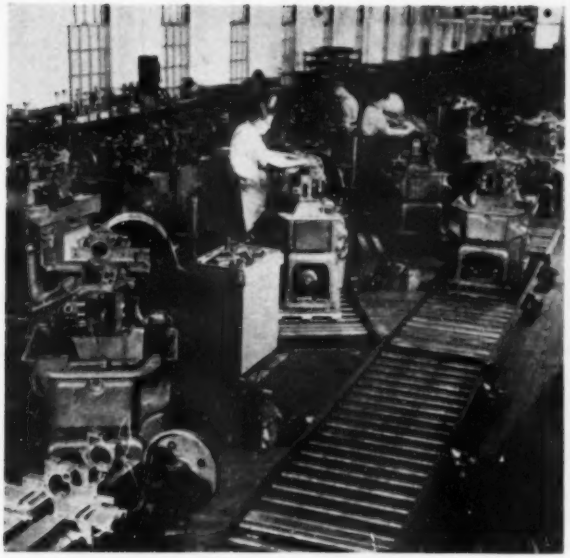


TURNTABLE SECTIONS are provided along the bed conveyor to permit accessibility. The section rotates around a kingpin in the floor, the load being carried on fixed-angle casters running on a circular floor plate. The shoe projecting from the near end of the turntable lowers a stop bar on the line when this section is swung back into position

BEDS ARE ADDED to tank assembly on a loop conveyor. Work is divided into eight parts, each called a "station", and all requiring about the same number of working hours. Beds are hoisted at right from the short central section of conveyor, where they are placed on arrival, to the base and tank assembly. Each tank has a stenciled serial number, and is kept in numerical order for convenience in scheduling various models or accessories

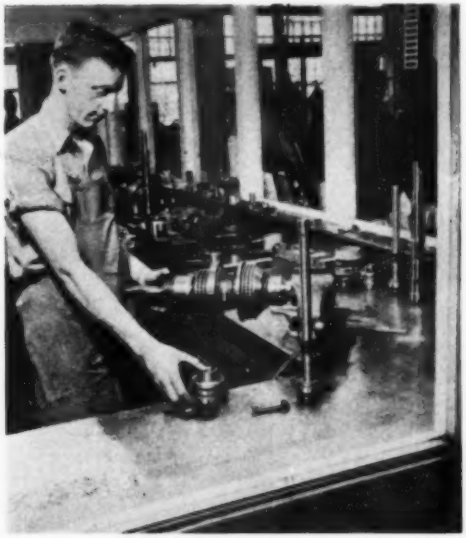


OIL TUBING (aluminum) connects the automatic oiling unit to the various bearings. Here most of the tubes are already in place. Tube is notched at desired length, snapped off, and the fittings applied



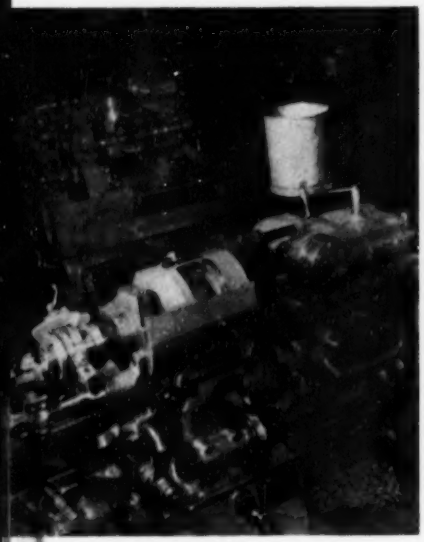
AFTER TUBING and lubricator-drive chains are installed (background) the unit rounds the loop, oiler is filled, and the machine is shunted into a test bay. A section of the line swings on casters (three of four such sections shown) to permit run-off to the 45°-angle test sections. The floor motors are belted to driving pulleys and the machine operated until oil appears from all pipes. Meanwhile, cross-slide and spindle-housing scraping is inspected, as is all piping

TURRET SLIDES are also scraped to the machine. Machines are set off the conveyor while this is done. Note that camshafts, electrical equipment, speed plates and such parts are already in place

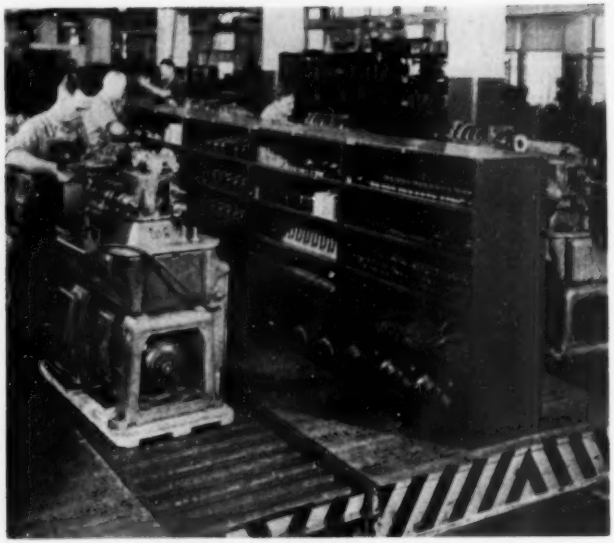


SPINDLES ARE ASSEMBLED in a dust-free constant-temperature room because of close tolerances required. During spindle assembly, spindles are held in a threaded holder clamped in the bench vise. After run-off testing and inspection, they are delivered to the proper station on the conveyor line

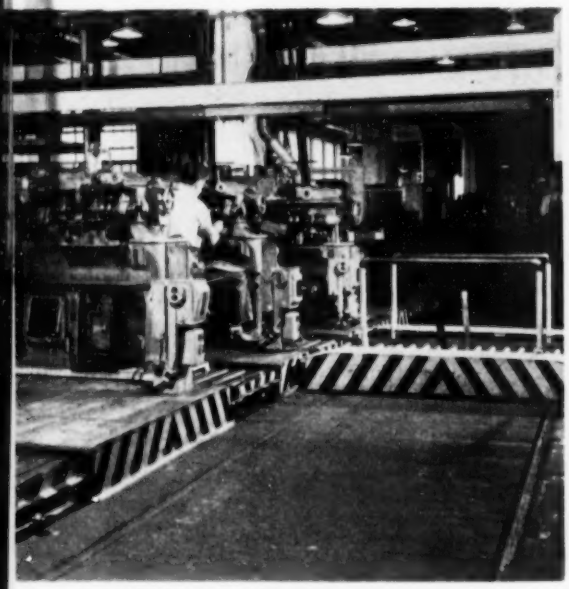
ASSEMBLED SPINDLES are laid on cloth in individual boxes for transfer to assembly. They are stored next to the line. Smaller sizes are lifted into place, as shown here, larger ones placed by hoisting. At this stage, all cams, levers, and the like are already in place, and parts removed to permit installation are replaced in the same locations



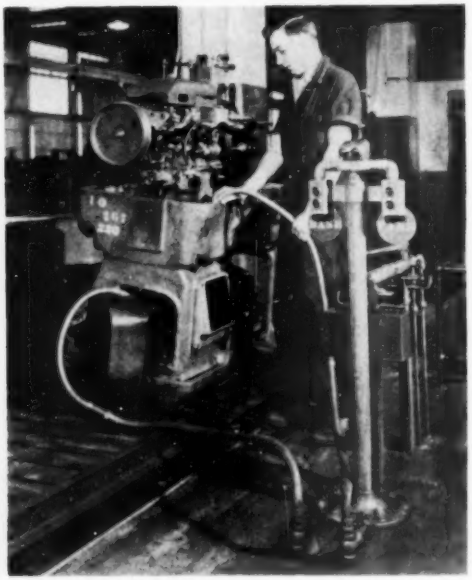
WHEN THE TURRET IS INSTALLED, holes are bored in position by putting the boring tool in the spindle. This assures alignment. To provide power for boring, outlets along the conveyor line provide 220- and 440-volt current, easily connected to the machine by plug and receptacle



MACHINES ARE NOW PRACTICALLY COMPLETE. Final operating parts, guards, and the like are added here, and preparations made for runoff and final inspection. On this line, larger sizes (OG & 2G) are on right-hand line, smaller (OOG) on left, but men or machines can be transferred to balance work load

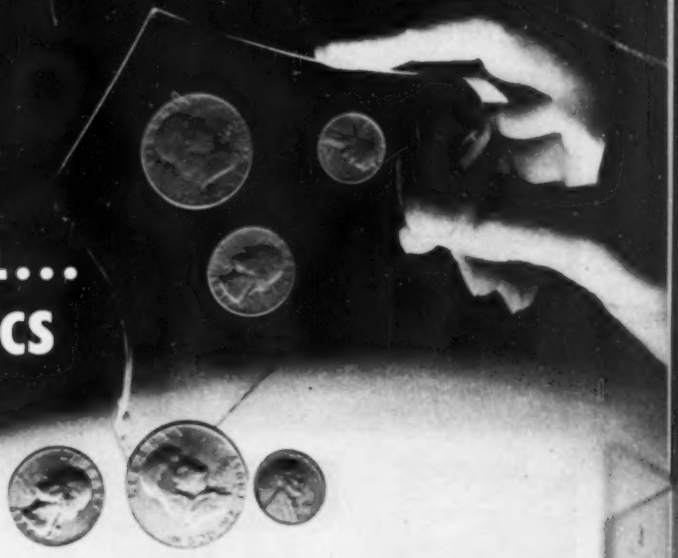


RUNOFF AND FINAL INSPECTION are at left. Three conveyor sections handle runoff—each having two or three stations with power outlets on a post. A transfer car feeds all three, plus a fourth (far left) used as storage if test stations are filled. The transfer car also conveys tested machines to cleanup line



AFTER TEST, the machine is rolled to a section of conveyor incorporating two hydraulic jacks. These tilt the machine so base (lube) and tank (cutting fluid) can be drained, the oils being filtered, then pumped back into overhead tanks from which other machines will be filled. Next the machine is thoroughly cleaned, guards and other fittings added, and painting done to complete the job

SOFT STEEL... and ULTRASONICS MACHINE CARBIDE



CARBIDE COINING DIE was made by sinking a brass medallion into its surface. Similarly an image was produced in a tungsten-carbide tool bit to show possibilities of the ultrasonic process. For actual embossing, a tool of soft 1010 or 1065 steel with reverse image of desired impression is generally used once before discarding

GLASS AND CARBIDE, or any other hard material, can be cut with soft tools and the ultrasonic process. Coin images were sunk in plate glass in a matter of seconds—with no damage to the coin. Brazed to conical element in Cavitron machine, pattern is vibrated at high frequency, low amplitude to produce clear-cut images in glass

Hard and brittle metals, as well as non-metals, are quickly and easily machined by unskilled help with the ultrasonic process. Soft tools, with boron carbide as an abrasive, drill and thread holes, produce complex cavities and recesses of any depth and shape in carbides, hardened tool steel, ceramics, glass, and other materials, conducting and non-conducting alike

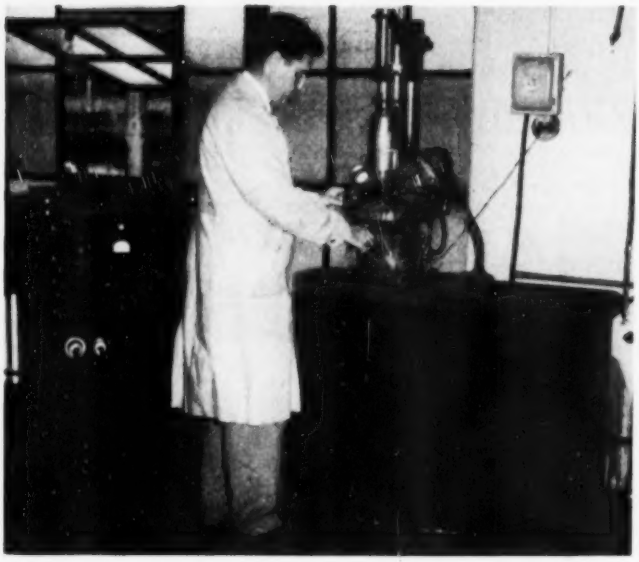
BY GEORGE H DeGROAT, ASSOCIATE EDITOR

ONE of the latest developments for machining "unmachinable" materials is the ultrasonic process, currently much in the news because of the increasing shortage of diamond bort for wheels to grind carbides and because of the demand for a process capable of handling present and anticipated demands for jet-engine and rocket production (see *AM*, Mar 17 '52, p 130). In an interview with Arthur Kuris, president of Cavitron Equipment Co, Long Island City, NY and Clifford Schuler, vice president, we learned some of the details of this simple means of doing the "impossible."

How the Process Works

Briefly, the process consists of vibrating, at high frequency and low amplitude, a soft tool having an end shaped to the desired contour, against a work-

SIMPLE BRAZING makes tools for ultrasonic process. Soft materials wear less than hard ones so that soft steel rod of desired shape and size is typical of inexpensive and easily available tools used. Tools are brazed to conical tool-holders which transmit and amplify mechanical vibration from a transducer in the Cavitron machine



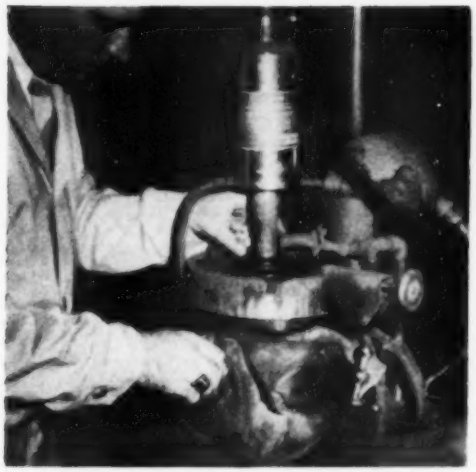
STANDARD EQUIPMENT in ultrasonic machine consists of electronic oscillator and power supply that deliver alternating current to transducer, in the frequency range of 16,000 to 29,000 cps. Transducer converts high-frequency impulses to mechanical vibrations which are amplified and carried from cone to tool. Resulting action permits all cutting, grinding and machining operations currently requiring diamond wheels and the consumption of scarce and expensive diamond bort

piece while a mixture of finely divided abrasive and water flows around and under the end of the tool on top of the work. Ordinarily, no movement of the tool is visible to the naked eye because the amplitude of tool movement at the high frequencies employed, (16,000 to 29,000 cps) is very small. Under light but continuous pressure, the tool sinks into the workpiece, which may be tungsten carbide, titanium carbide, zirconium boride, hardened tool steels, molybdenum, alnico, or other metals, as well as non-metals such as diamond, quartz, aluminum oxide, flint, glass, boron carbide, and others. Rubies for jewel bearings and germanium for transistors are sliced as easily as ordinary materials are conventionally machined. With this process, carbide dies can be solid—instead of being made in inherently weak sections conventionally required for complex shapes. Soft materials like plastics or lead, on the other hand, are not suited for machining by this process because they tend to absorb the abrasive particles rather than to chip under their impact.

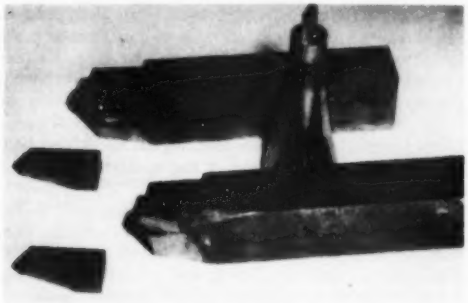
Good Finishes and High Production Rates

Roughing operations are normally carried out with accuracies of 0.002 in., using 280-grit boron carbide. Finishes are approximately 25 mu-in. rms. Higher accuracies and finer finishes are obtained with finer grit sizes, polished surfaces being attained with 1600- to 2200-grit Norbide in paste form. In cases of this type, the paste is applied between the tool and work with a drop of oil.

Cutting rates vary with the material being worked, the volume of material removed and the power of the machine. For example, a $\frac{1}{8}$-in.-thick carbide drawing die for producing 6 fluted splines was made in about 3 minutes with a spline, (of the



COMPLETE SAFETY to the operator is a feature of the ultrasonic process since high currents are not employed directly for stock removal and no sharp tools or grinding wheels are required



CHIP BREAKERS in 30 seconds to 2 minutes are possible with a simple rectangular blade brazed to conical tool-holder

TUBES SAVE CARBIDE by leaving usable slug from blank in making dies. Connections on side of tubular tools carry water and abrasive to tool face

type desired from the die) used as the tool. In another case, a carbide eyelet die for brass fasteners had small raised bosses produced around the flange to emboss serrations in the fastener blank. This work required about 15 minutes. Axial serrations 0.031 in. deep were put in a carbide knurling roll ¾ in. in dia by ⅜ in. long in 26 minutes. The tool was a simple soft steel sleeve with matching serrations in the bore. Previous time for this job was 30 hours.

Inexpensive Tools are Brazed to Holders

Tools are simply bar stock of 1010 or 1065 steel about 42 to 45 R_c, having the shape required in the work and brazed to a conical element that is in threaded engagement with a transducer. Setup and interchanging of tools is simple and rapid because it is only necessary to attach the tool to the cone and screw the assembly to the transducer. The cone transmits vibration from the transducer and amplifies it, the amount of amplification depending on the curve of the cone and the ratio of the large, (top) dia to small dia. Greater amplitudes are possible with greater ratios of top dia to bottom dia.

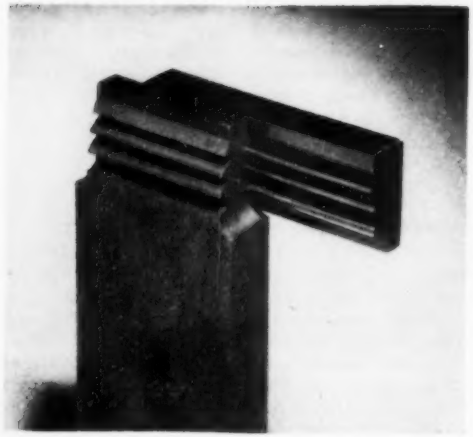
Cone, or tool-holder sizes, of course, are related to the mass of the tool required for any given job. While the tools themselves are relatively simple, their shape and size being determined by the job to be done, tool-holders are usually designed specially for each particular job. Consideration must be given the material to be cut, the type of hole or shape required and the rate at which it is to be cut.

Carbide Dies Made With Simple Tools

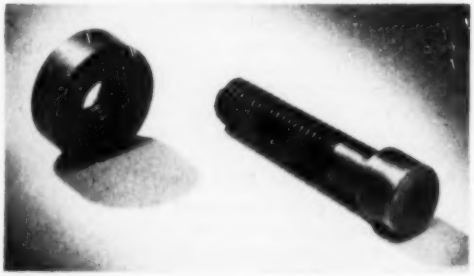
The apparatus is well suited for working fully sintered materials which are ordinarily partially machined in a pre-sintered state, finish machining being accomplished with diamond tools after sintering. For hexagon-shaped cold-heading dies made of carbide, hex steel stock can be cut to a suitable length and used as a tool. The same is true of dies where gear-tooth shapes are required. Here extruded spline stock is used for the tool. Squares, rectangles, circles and any other shape can be produced by tools made of available stock of the size and shape desired. Tubing is sometimes employed where large areas are to be cut to reduce the area of the working surface. Cores of expensive material resulting from use of tubing can be used for other purposes. Of course, this applies only to through holes, solid tools being necessary for blind holes and recesses. In relatively deep holes it may be necessary to run a second tool through the work to straighten tapers produced by tool wear. Trademark roller dies, embossing dies and cold-heading dies can be produced in carbide with letters and embossing in the cavity bottom. Tools are simple engraved blanks.

Making Coining Dies

Brass medallions have been employed to make solid carbide coining dies. As in other cases, the medallion is brazed to a cone and the tool is sunk into the carbide at a high rate of speed. Resulting



FIR-TREE PATTERN on titanium-carbide turbine-bucket blank was produced for Kennametal, Inc, with finish less than 25 mu-in rms, holding tolerances as close as 0.0003 in. with soft-steel tool shown, fed in flat rather than from the edge



STANDARD SCREW TAPS CARBIDE by rotating drilled blank in fixture with thread lead same as screw used for tool

recess has an extremely high fidelity of detail, good finish, and is accurate in depth.

Tapped holes are produced in carbide after making a hole of the tap-drill size, with a tool made by brazing the threaded portion of a screw to the cone. A slightly undersize screw is used to allow for displacement of grit. The work is held in a threaded adapter which has the same lead as the screw so that, as it is turned by hand, the work moves upward on a spiral as the tool feeds into the work, producing internal threads identical to those on the screw.

Curved Holes are Possible

One of the most unusual applications of the process is for producing curved holes. Round, oval, square or any other shape holes with axes curved to any degree—even right angles, are made with tools bent to the desired curve. Standing waves developed in the transducer are such that the energy produced is the same as if the tool were struck with a hammer. The force follows the curve to drive the tool in the direction of the curve. Tapered holes are also possible, as for wire-drawing dies where an entrance angle is required to meet a straight bearing surface. Exponential curved die walls are made too.

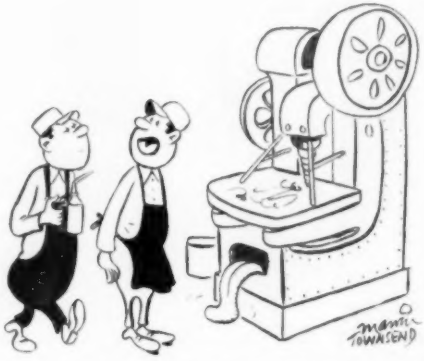
Carbide Cutting Tool Production Speeded

Outstanding applications of the process are for producing single-point carbide cutting tools, grinding chip breakers, sharpening milling cutters, broaches, hobs and other tools with carbide inserts, although some experimentation may be necessary for maximum efficiency, in the case of a particular type of tool. Chip breakers, however, have been ground in carbide ultrasonically with soft tools in from 30 seconds to 2 minutes. Carbide form tools have been made by simply using a soft steel templet which, when bent to shape and sunk edgewise into a carbide blank, produces a male and female form in one operation. Relief angles were produced at the same time in this manner. An example of this work is a flat form tool made in 14 minutes with the dimensions of a complex form held within 0.0005 in., relief and clearance angles being produced in the same setup. Grinding time for this tool with conventional diamond wheels was 7 hours.

Advantages and Limitations

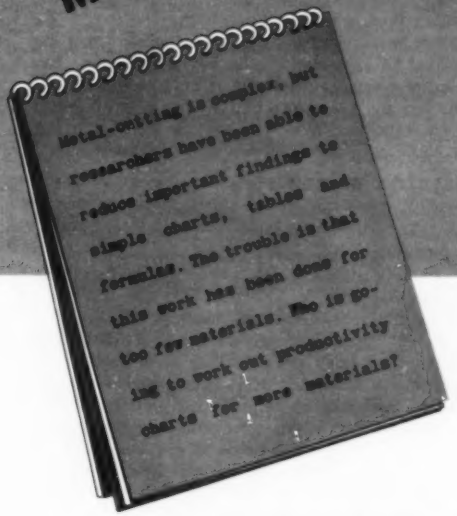
Besides the obvious advantages of this process, it involves very low stress and no local heating. As a result, there is no thermal cracking, pitting or burnt color left on work surfaces. The material cut undergoes no chemical change, decomposition or alteration of physical properties—Rockwell hardness of material remains unchanged. No skilled help is required and operation of the equipment is 100% safe.

At present, considerable experimentation is required to adapt the process to new applications. Tool design must be studied, fixtures developed for holding and moving new work, and power and current requirements determined. It is expected, however, that as further work continues and experience is gained, new uses will be discovered and greater efficiencies will be achieved with current work.



"Hurry with that oil, Gus, the machine's getting pretty dry."

MAKE RESEARCH DATA USEFUL TO THE SHOP MAN


Metal-cutting is complex, but researchers have been able to reduce important findings to simple charts, tables and formulas. The trouble is that this work has been done for too few materials. Who is going to work out productivity charts for more materials?

BY DR MAX KRONENBERG, Consulting Engineer, Cincinnati

ACCORDING to Tell Berna, a 5% improvement in exploitation of existing machine tools would be equivalent to a year's supply of new ones. In my opinion, we can get substantially more than a 5% improvement in production from existing machines by properly applying metal-cutting research to shop practice.

Our earliest distinguished researcher in metal-cutting, F W Taylor, realized the significance of such research for shop practice but could not present formulas simple enough for practical application. The question of the best speed and feed for a specific job seems simple enough, but actually there are many more quantities to be considered than the twelve that Taylor recognized. Hence, the practical man usually relies upon data found in engineering manuals. Usually, these data represent observed experience and have such wide tolerances that it is nearly impossible to determine optimum values for a specific job with sufficient accuracy.

In an effort to improve this situation, the significant metal-cutting data derived in the United States, England and Germany have been investigated, and brought into a logical system. Numerous new tests have been conducted. Many of the formulas and the data discovered in this way have proved useful in practice. What we need now is additional data on the new hard-to-cut materials.

Despite good progress by the current-day researcher, his findings have not found their way into the hands of the men who are supposed to use them – tool engineers, time-study men, supervisors and operators.

To "get the message through" to those who need it, the researcher should present his data in ways best suited to the eventual user. The means may be charts, tabulations, or instruction sheets.

Charts give a survey of the problems involved and permit ready realization of the effect of change from one quantity to another. Intermediate values are more readily found from charts than from tabulations.

Tabulations are more useful than charts when a reading must be duplicated exactly.

PRODUCTIVITY CHART

For a general survey of the relationships involved in practical application of metal-cutting research, a productivity chart (Fig. 1) is useful. Such a chart conveys basic conclusions to supervisors, tool engineers, processing engineers, time-study men, and others. To them the productivity chart should become as important as the iron-carbon equilibrium diagram is to the metallurgist.

In making up the productivity chart (in this case for SAE 1035), the lower horizontal axis is plotted in terms of chip areas (feed × depth of cut) in values between 0.002 to 0.050 sq. in. Cutting speed is plotted on the vertical axis for a range from 30 to 600 fpm.

At the top of the chart, a scale for cutting forces

Adapted from the paper "Reducing Metal Cutting Research to Practice," as presented by the author at the Metal Cutting Conference, Massachusetts Institute of Technology, June 5-6, 1952.

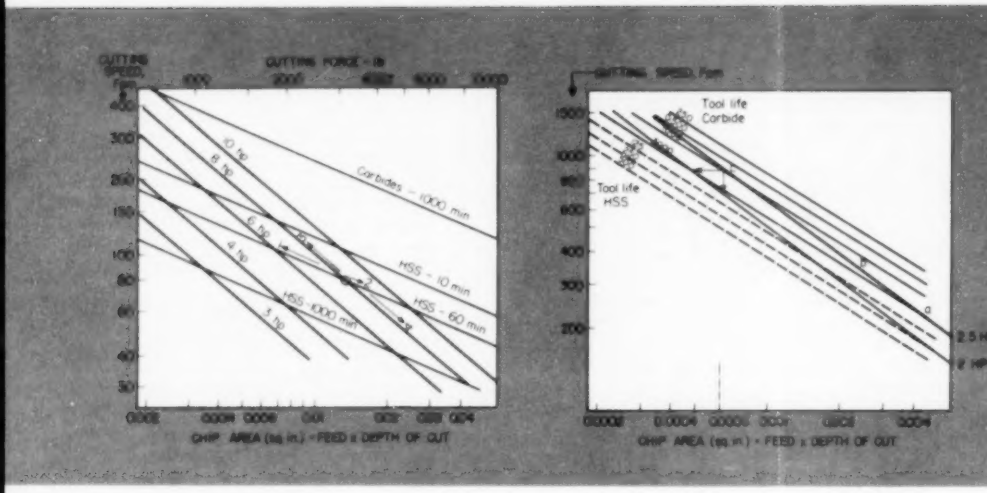


Fig. 1 – Productivity chart for SAE 1035 (using tool with true rake angle of 20°) discloses that capacity of an existing machine is fully utilized by following the colored horsepower line when choosing a feed-speed combination. In example, direction of arrow 3 gives good finish; arrow 4 is the direction for roughing

Fig. 2 – For a brass screw-machine part, a productivity chart aids selection of a speed-chip area combination for good tool life, suitable production rate, and utilization of machine capacity

is plotted covering forces from 500 to 10,000 lb. Cutting force is a very important quantity in metal-cutting, and is required for determining deflection and whether the machine or the workpiece is rigid enough with respect to the accuracy demanded.

In the center field of the chart, *two* series of lines descend from left to right at different slopes. The lines with the smaller slope (and shown in black) are the result of tool life investigations, while those with the larger slope (shown in color) are derived from horsepower and cutting force investigations.

These two series of sloped lines represent the *two main concepts of machinability;* one based on tool life, the other on cutting resistance. Since it is evident that the two series of lines do not coincide, we cannot come to agreement as to machinability unless we adopt either one or both relationships for such a definition. I personally favor adopting cutting resistance, because this quantity does not change with invention of a new tool material. Cutting resistance measures the ease of metal removal. However, whatever *you* prefer, the productivity chart takes care of both concepts and provides the most complete survey.

Very likely we should have a "Machinability Atlas" composed of numerous productivity charts covering all materials.

With the aid of an atlas of productivity charts, any production engineer would be in a position to ascertain readily how he could best machine a given material and what variations he can expect if he changes one or several of the quantities involved.

Use of the Chart: Assume an 8-hp machine, a HSS tool, and a tool life of 60 min. for the removal of a chip of 0.013-sq-in. area (¼-in. depth by 0.050-in. feed). The colored circle at the intersection of 8-hp line with the HSS-60 min. tool-life line shows that these conditions will be satisfied when the cutting speed is set to 80 fpm.

Suppose it is now desired to investigate the changes that occur in the rate of metal removal if speed, feed, horsepower or tool life are changed.

Following the 60-min. tool-life line in direction of arrow 1 results in an increase in cutting speed and a reduction in feed. However, we approach the 6-hp line. Hence, an 8-hp machine cannot be fully utilized if the feed is *reduced* and the speed *increased* while keeping tool life constant. Metal removal would be reduced: At the colored circle: $0.013 \times 80 \times 12 = 12\frac{1}{2}$-cu in./min. metal removal; at point 1: $0.0065 \times 105 \times 12 = 8.2$-cu in./min. metal removal. This is a loss of 35%.

Following the 60-min. tool life in the opposite direction, along arrow 2, results in an *increase* in feed and a *decrease* in speed. Here the 10-hp line is approached, indicating that an 8-hp machine would be overloaded, which is not practical for any length of time.

A third possibility is indicated by arrow 3. We again increase the speed, but even more so, and reduce the feed. In this case, we leave the 60-min. tool-life line and approach the 10-min. line. Because such a short tool life would be undesirable, we change from HSS to cemented carbide and thereby increase tool life to more than 1000 min. Metal removal at point 3 is somewhat less than at the colored circle, namely only $0.0065 \times 144 \times 12 = 11.2$ cu in./min. This is, however, a loss of only 10% as against the loss

of 35% when maintaining a constant tool life.

The loss in cubic inches is compensated by a gain in tool life, reduction in downtime for changing the tool, improvement in surface finish from disappearance of the builtup edge at higher speeds, reduction of deflection as indicated by the reduction in cutting force, which drops from 3200 lb at the colored circle to 1800 lb at point 3.

In spite of the loss in metal removal, which is always the result of feed reduction and speed increase, it is often desirable to reduce the feed and increase the speed according to the colored horsepower line, as indicated by arrow 3.

This type of varying speed and feed is recommended whenever the workpiece is unstable or when a high surface finish is desired. The selection should be made in accordance with the colored horsepower line and not in accordance with the tool-life line. The tool should be adapted to the horsepower of the available machine.

Another possibility remains, as indicated by arrow 4. Here the feed is *increased*, the speed *reduced* and the horsepower again is kept constant. Tool life of HSS is improved, the 1000-min. tool-life line is approached and the metal removal is likewise improved in comparison with the colored circle. Metal removed at 1000-min. tool life is 15.3 cu in./min., a gain of 22%.

However, the cutting force increases considerably; namely, from 3200 to 8000 lb. The workpiece and the lathe would therefore be deflected considerably more than at the colored circle, resulting in poorer finish and reduced accuracy. This type of change is therefore *recommended only in the case of roughing heavy workpieces on powerful and rigid machines.*

TIME-STUDY APPLICATIONS

Fig. 2 represents a portion of a productivity chart for machining 1-in. brass barstock on a 2½-hp automatic screw machine. The 2½-hp line has been marked out in color for a better reading. By following this line from left to right we obtain for each point a different combination of speed, feed, cutting time, etc. The cutting speed increases, while the chip area decreases. For example:

Point	*Chip Area,* sq in.	*Speed,* fpm	*Life,* min.	*Tool*
a	0.004	225	60	HSS
b	0.002	375	2000	C.C.
c	0.00064	900	1000	C.C.

Which combination of feed and speed will, however, be the most favorable in practice?

Note point *c* and the two arrows shown. One arrow is placed horizontally on the 900-fpm line, the other one vertically on the 0.00064 chip-area line.

Table 1 represents a form sheet used by the time-study engineer as a supplement to the productivity chart.

At the top, the main data are recorded, such as 1-in. dia barstock and 2½-hp automatic screw machine. Usually, the time-study engineer assumes a feed rate that he thinks will produce a satisfactory surface finish. This assumption is 0.0051 ipr which is available on the machine. Chip area is therefore 0.00064 sq in. for a depth of cut of ⅛ in.

SETUP A. For the initial set of conditions, the productivity chart, Fig. 2, shows that the speed for 0.00064 chip area is 900 fpm (point *c*). Tool life with carbide is 1000 min., the calculated cutting time is 3.42 sec per 1 in. of length.

Considerable downtime is involved in changing tools, and hence 1000-min. tool life is not satisfactory. The time-study man wants 3000-min. tool life and consults the chart again.

There are at least *two answers* to the question

Table 1
TIME STUDY FOR SCREW-MACHINE PART

Brass, 1-in dia, 2½-hp screw machine.
Assumed feed = 0.0051 ipr — Chip area = 0.00064 sq in.
Depth of Cut = 0.125 in.

SET UP	PROBLEM	ANSWER	CONCLUSION
A	Speed (for 2½ hp and 0.00064 area)..	900 fpm	
	Tool life	1000 min.	Tool life not satisfactory
	Time	3.42 sec per 1 in.	
B	3000 min. tool life? (by feed reduction)	Chip area = 0.00047 sq in. Feed = 0.0038 ipr	Time not satisfactory
	Time	4.6 sec per 1 in. (34% increase vs A)	
C	3000 min. tool life (by speed reduction)	Speed = 740 fpm	Savings in downtime, 200%
	Time	4.15 sec per 1 in. (21% increase vs A)	increase in tool life and better time than in B

Table 2
MACHINING DATA FOR LATHE #486

CHIP AREAS FOR CI						CHIP AREAS FOR STEEL					
Rpm						Rpm					
355	250	180	125	90	Dia	355	250	180	125	90
(2.9)					1.0	(2.9)				
2.6*	(5.9)				1.5	2.2	2.7	2.9	3.4	(5.0)
0.9*	1.8*	5.6*	7.2		2¼	1.2†	1.5	1.7	1.9	4.7
	.4*	1.2*	3.9*		3½		0.9†	1.0†	1.2	2.6
					5	(2.5)	3.1	3.9	0.6†	0.8†
					7½	2.0	2.3	3.0	5.5	0.6†
					9½	1.5	1.7	2.2	3.6	0.5†
					12.0	1.2	1.3	1.7	4.3	
					15.0	.9	1.0	1.3	3.1	
63	45	32	23	16		63	45	32	23	16
Rpm					Dia	Rpm				

* power reduced to improve tool life
( ) use only when workpiece is sturdy
† cem. carbides

Table 3—DATA FOR SPLITTING CHIP AREA INTO FEED AND DEPTH OF CUT

Chip Area = Feed × Depth of Cut

Chip Areas (1/1000 sq in.)

Depth of Cut, In.	FEED, ipr										
	0.05	1.0	1.5	2.0	2.5	3.0	4.0	5.0	8.0	10.0	30.0
1/16	0.008	0.016	0.024	0.032	0.040						
1/8	0.004	0.008	0.012	0.016	0.020	0.024	0.032	0.040	0.064		
1/4		0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.032	0.040	
1/2			0.003	0.004	0.005	0.006	0.008	0.010	0.016	0.020	0.060
3/4						0.004	0.005	0.007	0.011	0.013	0.040

Table 4—VALUES FOR FACTORS IN CUTTING-FORCE FORMULA F

C_p Values for SAE Steels

True Rake of Tool, deg	1015	1035	1045	1060
35	270	358	406	473
25	296	391	445	516
20	308	408	464	538
15	320	424	481	560
10	330	439	498	579

$(1000A)^r$ Values

A = Chip Area, (Sq In.)	Steel	CI	Brass	Al
0.001	1.00	1.00	1.00	1.00
0.003	2.4	2.6	2.28	2.82
0.005	3.6	4.0	3.35	4.55
0.010	6.4	7.3	5.6	8.7

Example: SAE 1035; chip area = 0.010; True Rake = 20°;
$F = 408 \times 6.4 = 2610$ lb.

of how he can secure 3000-min. tool life. They are shown by the two arrows at point *c*, Fig. 2, and recorded at Setups B and C, Table 1.

SETUP B. By following the horizontal arrow on the 900-fpm line, he finds that 3000-min. tool life can be obtained by reducing the chip area to 0.00047 sq in., which corresponds to a feed of 0.0038 ipr. The cutting time, however, increases to 4.6 sec, which is an increase of 34%. Therefore, cutting time is not satisfactory.

SETUP C. By following the vertical arrow from point *c* on the 0.00064 area line, he finds that 3000-min. tool life can also be obtained by reducing the speed to 740 fpm. This value is adopted, because the cutting time is 4.15 sec per 1 in. of length, which is less than for Setup B, while giving substantially better tool life than Setup A.

OPERATOR'S SHEET

The preceding charts are useful to time-study engineers and production planners, but a different method is more effective for making metal-cutting research available to the machine operator.

If the operator is a skilled mechanic, it is often possible to attach to his machine a simplified diagram indicating the recommended feeds and speeds.

If the operator is not able to read a technical chart, he can be furnished with a tabulation like that shown in excerpt in Table 2.

Figures above the stepped line refer to rpm at the top of the table, and those below the stepped line refer to rpm at the bottom of the table. The figures represent chip areas in 1/1000th of a square inch; hence 2.5 = 0.0025 sq in. The most effective combination of chip area and rpm for a given work dia is indicated by a circled figure in each row, such as 2.5 in combination with 63 rpm for 5-in. work dia.

Machining data presented in Table 2 refer to a cone-driven lathe, where the horsepower changes considerably with the position of the belt. Hence, the previously mentioned fact that metal removal increases with a feed increase and a speed decrease does not apply when a change in horsepower occurs in conjunction with a change in speed.

Table 3 shows another method that makes it easy for the operator to split the chip area into feed and depth of cut. For example, a chip area of 2½ thousandth sq in. corresponds to a feed of 0.005 ipr and a depth of cut of ½ in.

USEFUL FORMULAS

Designers in engineering offices and many production planners are in need of metal-cutting research data adapted to their needs. Here we may use formulas, in addition to tabulations.

The discussion will be limited to the *cutting force* and to formulas derived for materials tested several years ago, because data for more recent materials are still lacking.

The basic formula for cutting force is:

$$F = C_p \cdot (1000\ A)^r$$

Where

F = cutting force, lb.

C_p = a constant depending on material and tool angles, as derived from research.

A = chip area, sq in.

r = an exponent derived from research for various materials.

Calculation of the cutting force with the aid of this formula can be simplified to multiplying tabulated values of two factors: C_p and $(1000\ A)^r$, as in Table 4. Constant C_p has a value of 408 in the case of SAE 1035 and a tool with a true rake angle of 20°. The value of constant $(1000\ A)^r$ is 6.4 for machining steel with chip area of 0.010 sq in. (depth of cut of ½ in. and a feed of 0.020 ipr). Therefore, $F = 408 \times 6.4 = 2610$ lb.

Cutting force does *not* increase proportionally to the feed (or the chip area) but at a lower

rate, as is evident from Table 4. The cutting force increases only 6.4 times when the chip area increases 10 times in the case of machining of steel. *This is the reason for the increased output in metal removal* (cu in. per min.) *at increased feed*, coupled with reduced speed at constant horsepower, as previously discussed in connection with the productivity diagram.

Significance of cutting force is often underrated. We need more information on the values of the cutting force for machining of newer materials, especially high-temperature alloys, titanium, etc. A machine-tool designer or the production engineer or the executive in charge of purchasing machine tools cannot intelligently determine the required horsepower of a machine to be built or bought, unless cutting-force data are available.

It is sometimes held that horsepower and cutting force are less important than tool life, and that we "can take another machine when the one we use is not strong enough." Such reasoning seems out of line with the requirements of shops, whether big or small. We have to take – in most cases – the machinery available and utilize this machinery to best advantage. Thus, we are limited in speeds, feeds and tool life by the horsepower of the machine.

AIR FORCE DATA

When studying the data on machinability *vs* microstructure published by the Air Force, one cannot deny that this information represents an important forward step compared with earlier publications of this type. However, as far as *cutting force* information is concerned, much remains to be desired.

On the other hand, the Air Force data on *cutting speed* supplies useful information that may be reduced to practice.

Table 5 is an example of the reduction of the Air Force data on cutting speeds to practice. In this case, the following formula* applies:

$$V = \frac{C_1}{T_n}$$

Where

V = cutting speed, fpm

T = cutting time between resharpenings

C_1 = a constant (for a given material and tool) numerically equal to a cutting speed that gives a tool life of one minute

n = an exponent that varies to some extent with work material.

*Tool Engineers Handbook, p324, Table 17-6. McGraw-Hill Book Co., NY.

The value for $C_1 = 2000$ for SAE 1020 checks well with earlier data,* while the C_1 values for the other materials (SAE 8620, 4340 and 52100) have been newly derived by us from Air Force research. From these C_1 values, it may be concluded that the cutting speed for machining SAE 52100 should be set to exactly one-half the speed for SAE 1020 when the same tool life is desired, because C_1 for 52100 is one-half of C_1 for SAE 1020.

Many more practical conclusions may be drawn from the Air Force data so far as cutting speed and tool life are concerned, but unfortunately only very little about cutting forces.

CHRISTMAS-TREE CHART

Considerations that hold for turning operations apply also to milling, drilling, etc. *One* example has been selected from our drilling research, Fig. 3. Data from investigations of twist drills as well as data from investigations of power and rigidity of drilling machines are incorporated in this diagram.

In practice, the permissible feed for drilling is limited by *two* major factors, which oppose each other. One factor is the strength of the twist drill

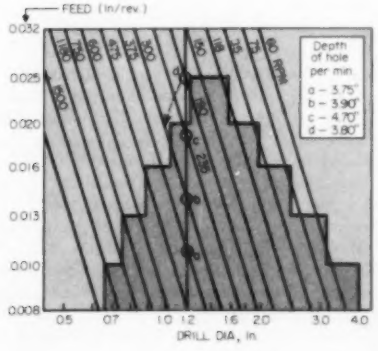


Fig. 3 – All feeds below the stepped line in this "Christmas tree" chart for a drilling machine may be used without fear of drill breakage from excessive cutting force or machine deflection

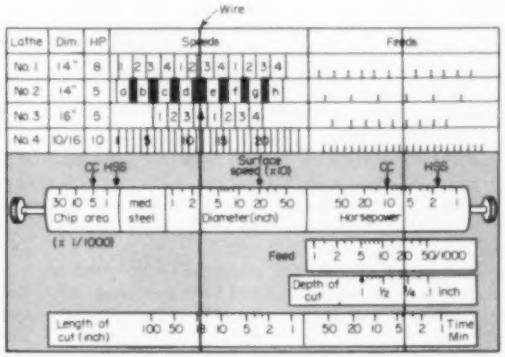


Fig. 4 – Colored fields on the machine selector board show portions of the cutting-speed range unobtainable on the machine for lack of correct rpm. If vertical line (wire) cuts colored field, the machine does not provide needed spindle speed

Table 5—CONSTANTS FOR CUTTING-SPEED FORMULA $V=C_t/T^n$

MATERIAL	C_t	n
SAE 1025	2060	0.17
1020	2000	0.27
8620	1600	0.27
4340	1300	0.27
52100	1000	0.27

Note: Constants for SAE 1020 to 52100 are calculated from Air Force data and apply to use of carbide tools

itself, which *increases* with increasing drill diameter. The second factor is resistance of the machine, which decreases as the cutting force is increased.

From numerous tests we have found that the permissible feed increases as the 1.5th power of the diameter.

Other tests concerning drilling-machine deflection show that the feed must be reduced in inverse proportion to the drill diameter after the drill diameter exceeds a certain maximum, which varies often with the machine design.

The question arises as what to do with these data, so that the shop, the customer, the sales engineer and others may benefit from it? The Christmas-tree diagram, Fig. 3, is the answer. It refers to drilling SAE 1035 on an 8-hp machine.

Ascending steps show how the feed may be increased with increasing diameter of the hole. *Descending* steps show how the feed must be reduced for large diameters if machine deflection shall be kept within admissible limits.

The zone underneath the stepped lines contains the feeds that may safely be selected from the point of view of strength, both of drill and machine. Selection of cutting speed and rpm are at the discretion of the user, who may employ any cutting speed within the capacity of the machine, which is likewise incorporated into the chart.

Example: What is the best combination of feed and rpm to give the shortest production time for drilling a hole of 1.2 in. dia?

When following the vertical line through 1.2 in. dia. it will be seen that the oblique rpm-lines are intersected at points *a*, *b* and *c* within the safety zone and at point *d* outside that zone.

At point *a* we have 375 rpm. The nearest feed to this intersection point is 0.010 ipr. Depth of hole per minute is accordingly 3.75 in., as shown at left in Fig. 3.

At point *b*, we have 300 rpm and 0.013 ipr, likewise corresponding to a production of 3.9 in. per min.

Point *c* – 235 rpm and 0.020 ipr – gives the greatest penetration per minute (4.7 in. per min.) without overloading either tool or machine and is therefore the preferred value. To select the combination indicated by point *d*, would require a reduction in feed (due to overloading the twist drill) and consequently reduce the depth of hole per minute.

The horsepower capacity of the machine will not be fully utilized unless the points are actually located on the feed lines. The machine motor is somewhat overloaded if the nearest larger feed is selected and underloaded when the nearest smaller feed is taken.

Underloading and underproduction can be avoided by reducing the increments in feed, that is, by redesigning the feed box of this machine. As an example, the depth of hole for point *b* could be increased to 4.2 in. per min., if a feed of 0.014 ipr could be made available on the machine.

SELECTOR BOARD

The selector board for machine tools, Fig. 4, has been used by production planners and sales engineers to demonstrate production losses caused by obsolete machines and the better performance of new machines.

Four horizontal rows are marked: "Lathe 1, 2, 3, and 4." Speeds of the machines are indicated by small rectangular fields. Widths of these fields represent a tolerance in cutting speed when the desired rpm cannot be obtained exactly on the machine, a fact often overlooked in theoretical discussions. If the tolerance is exceeded – as on many older machines – a colored field is shown, calling attention to the fact that the desired cutting speeds cannot be obtained on the machine within reasonable limits. Lathe No. 2 is such an old machine.

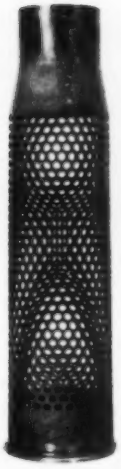
Scales immediately beneath the speed fields are located on a roll, which can be rotated and shifted sidewise to consider various materials.

USE OF SELECTOR BOARD: Shift the roll so that the selected chip area (here 5/1000th sq in.) comes under the arrow for the tool (C.C. = cemented carbide). *All other data can then immediately be read.* The *cutting speed* correlated to the chip area appears under the middle arrow by multiplying the figure appearing there by ten, ($20 \times 10 = 200$ fpm).

The required *horsepower* is also found without further calculation; namely, under the right-hand arrow for cemented carbides. In this example, a machine of 10 hp is needed.

In addition, the available *machine best suited* for the job can be determined by a vertical line (movable wire) marked "Example." Here, the wire is placed over 3-in. dia for determining the machine that best satisfies the given cutting conditions. For 3-in. work dia, Lathe No. 2 would not be considered, because the wire passes through a colored field, indicating that the desired cutting speed cannot be obtained. The best machine would be lathe No. 4.

These charts, tabulations, formulas and instruction sheets are but a small portion of the information that the researcher on metal cutting must turn over to the operating man.



CARTRIDGE CASES for 75-mm recoilless rifle are now deep drawn from scale-free, hot-forged cups instead of blanked disks

- ***eliminate 14 progressive steps...***
- ***save tons of spheroidized steel plate...***
- ***simplify scrap handling...***
- ***reduce tool and die cost, when...***

CARTRIDGE CASES ARE DRAWN FROM HOT-FORGED CUPS

BY GEORGE H. DeGROAT, Associate Editor

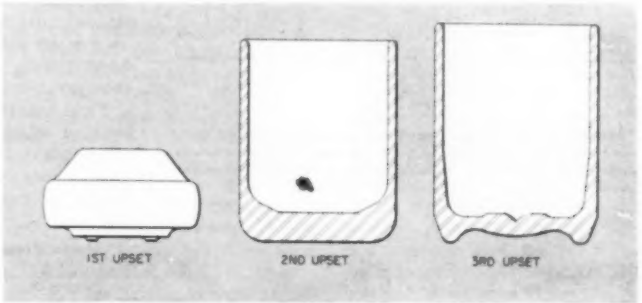
HOT-FORGED CUPS are being supplied Frankford Arsenal, Philadelphia, Pa., for experimental use in deep-drawing steel cartridge cases for the 75-mm recoilless rifle. The cups are SAE 1030 hot-rolled steel bar stock and are equivalent to those made in 14 operations from spheroidized plate of the same material. Besides eliminating several operations, the bar stock saves tons of steel normally lost as scrap, or "grid loss" in blanking disks from plates. At the same time, use of hot-rolled steel, as rolled, eliminates the present long cycle and expensive annealing. Only three basic operations are required—sawing bar stock, heating bars, and forging.

Interest in the steel hot-cup process preceding deep drawing was aroused in Frankford Arsenal by the Rheem Mfg Co, Lester, Pa., in 1950 at a meeting called to discuss new and more economical methods of making the cases. Rheem, having experience in drawing brass cartridge cases and having conducted experiments with steel cartridge cases by the hot-cup method, was awarded a contract to develop a method and manufacturing procedure.

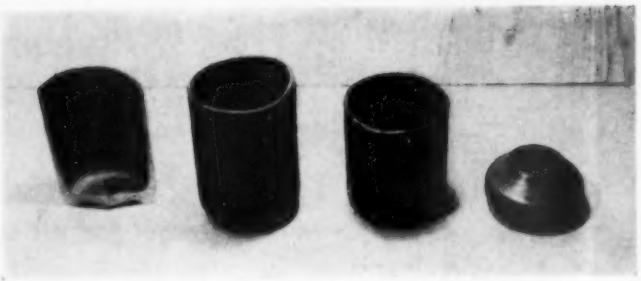
The method and procedure is part of an Ordnance Corps economy program aimed toward evaluation of new processes that show promise. The Ordnance Corps takes into consideration the long-range possibility of continuing to develop and expand such a process in the face of material and equipment shortages.

. . . High Quality Material, Free From Defects

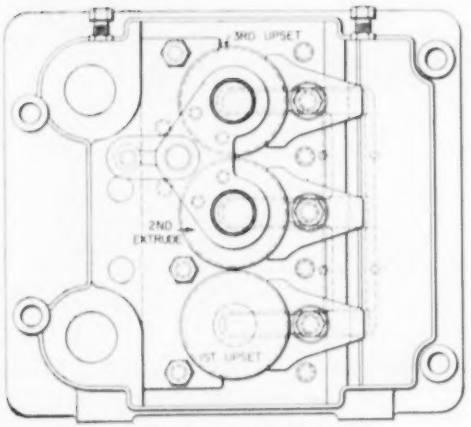
The hot-forged cup meets every requirement. The raw material is in accordance with Federal Specification QQ-S-633, that is hot-rolled carbon steel, aluminum killed to produce fine grain. Bar stock, 2½ in. in dia. as received from the mill, is carefully inspected for laminations, grooves, slivers, folds, or deep rust. Any of these defects is sufficient cause for rejection. Bars having scratches less than 1/16 in. deep and free of other defects are sawed into 5⅝-in. lengths. Power saws replace usual nick-and-press-breaking to insure square ends and uniform weight. Slugs are visually inspected, and any scratches ground out with a rubber-mounted abra-



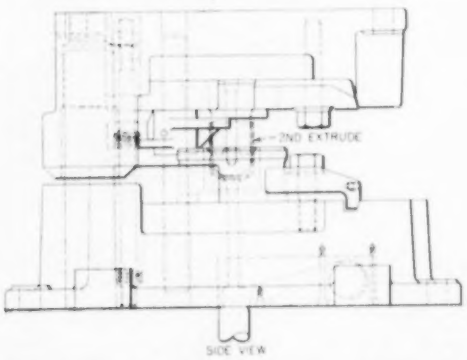
FIRST STEP in producing hot-forged cups is to upset 2½-in.-dia by 5⅛-in. long HRS bar stock to form slug shown at left. Second step, center, follows and final operation (right) produces a cup dimensionally and physically suited for drawing die



THREE STEPS required in hot-forging bar stock into cups ready for drawing replaces 14 operations need to process plate stock to the same state. Finished cup at left is cut through center to show inner contour



PLAN VIEW OF BOTTOM BOLSTER



SIDE VIEW

FORGING DIE has 3 stages for producing cups from hot bar stock. Die is employed in a 1600-ton press, the need for high pressures arising from the difficulty in moving metal in relatively thin-walled sections

sive wheel. Burrs caused by sawing are also removed on the grinder.

These precautions are necessary because mechanical defects are not healed by hot pressing, at least to the extent required.

Slugs are preheated in a furnace at 1000F, then carried to submerged-type furnaces for final heating to 2100 to 2150F. The usual forging furnaces would produce scale which causes severe die damage by abrasion. Heating in molten salt leaves a protective film on the slugs until they are in the dies.

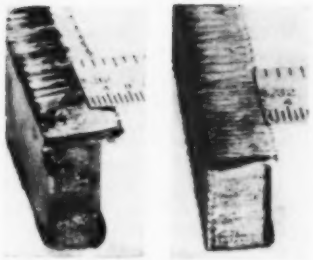
Cups Made in 3-Stage Die

In a 1600-ton crank-type forging press, the hot slug is always in compression, as far as possible, to avoid stretching and to maintain high physical properties. Tooling for this method consists of a 3-stage die in which the billet is first formed or "cabbaged" down, into a flat slug, then upset to form a rough cup, and, finally, forged into the final shape, one press stroke for each operation. Every tenth cup is checked at the press for wall thickness, over-all height, and ovality. All cups fit, and are physically ready for conventional dies used in the subsequent deep-drawing operation.

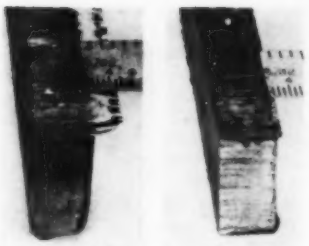
A steel belt conveyor carries the cups from the press through a cooling tunnel to a drillpress. Here each cup is placed in a holding fixture and two small stem-like metal-intrusions from the breather holes in the punch are removed from the inside surface of the base by a spot-facing tool. Next step is to place them in metal baskets for dipping into a 10% sulfuric-acid solution for 20 min. at 140F. After a water rinse at the same temperature, the cups are allowed to drain at one end of an inspection bench, then inspected for visual surface seams, cracks, laminations, and folds. Only shallow seams which can be ground out are accepted. Cups are free of imbedded scale, seams, folds, laminations, blisters, and deep scratches.

Final operations before sending cups to the Arsenal or other facilities for deep drawing are to dip them in a rust-preventive oil and wrap them in oilproof paper for shipping. Drawing operations that follow are conventional.

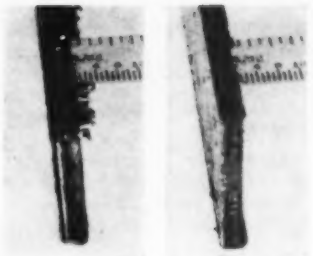
AMERICAN MACHINIST *appreciates the cooperation of Harold J Babcock, chief of the Industrial Service Branch, Artillery Ammunition Dept, Frankford Arsenal, and that of Joseph Glandix, project engineer, Rheem Mfg Co, Lester, Pa., in supplying information for this article.*



CUT MADE WITH BOX-STRAP BAND (left) and friction-saw band (right) on armorplate, using 19½-lb pressure. Note the heavy burr on the box-strap sample



EXCESSIVE HEAT PENETRATION and burr on first cut at 30½ lb with box strap (left). Sixteenth cut with saw band (right) shows minimum burr and heat penetration



TYPE OF CUT made with box strap on stainless steel (left) at tenth cut. Twentieth cut with friction saw (right) shows no burnt surface and virtually no burr

Labor Is the Big Factor in Friction-Sawing Costs

Blade cost is a minor element in friction sawing. Also to be considered are saw life, heat penetration into the work, amount of burr—and most of all, labor. Here are results of recent research comparing friction band blades and box strapping

Readers of "Talking Shop" will recall the item (*AM*—July 7 '52 p171) describing the use of ordinary box strapping as a toothless band-blade for friction-sawing stainless steels and other ferrous alloys. Just-received research information provides added data on this subject, about which relatively little has been published although the process dates back at least ten years.

In the first place, friction sawing heats the material ahead of the cutting edge and, as the sawband passes at high speed, the teeth wipe out or cut out the softened materials from the kerf. The approximate temperature reached is the forging temperature of the material involved—it is not a burning operation. The teeth lessen the feed pressure needed, minimize heat penetration into the side walls, and minimize burr size.

Maximum efficiency and economy can be attained only with a saw band proper for the process. A saw band intended to generate heat must obviously differ in metallurgical characteristics from one expected to minimize it. Hence tooth sharpness of the friction saw band is not a factor. Essentials are rather: teeth permanently anchored and locked in place, and maximum flexation to provide long and uninterrupted production.

The difference between "cutting out" (as the saw band does) and "wiping out" (as the toothless strap does) the material after it has been softened is shown by these lab tests: On 5/16-in. armorplate, 6 cuts were made, 5 in. long, with a feed pressure of 19½ lb. Box strapping cut 1.9 in. per min; friction-saw bands cut 17.9 in. With strapping, the burr at the bottom was 0.156 in., at the top 0.046 in.; with the saw band the bottom burr was only 0.062 in., with no top burr. Heat penetration was excessive with the strapping, shallow with the saw. When an attempt was made to cut at 30½-lb pressure, the strapping made only one cut, but the saw was still good after 16 cuts.

Bringing this down to a cost basis, strapping would cost $376.85 for 8592 linear in., saw bands only $40. This does not include tool cost, but is based on $2 an hour labor cost, plus 150% overhead.

If the cost of a box strap band is 10c and its flex life 29 hr, whereas a friction saw band costs $3 and its flex life is 2 hr, the total tool cost per 8-hr shift would be approximately 3c per box-strap band as against $12 per friction-saw band. However, when the labor cost is brought into the picture, total cost of production is $376.88 for box-strap bands, $52 for friction-saw bands, to attain cuts totalling 8592 linear inches.

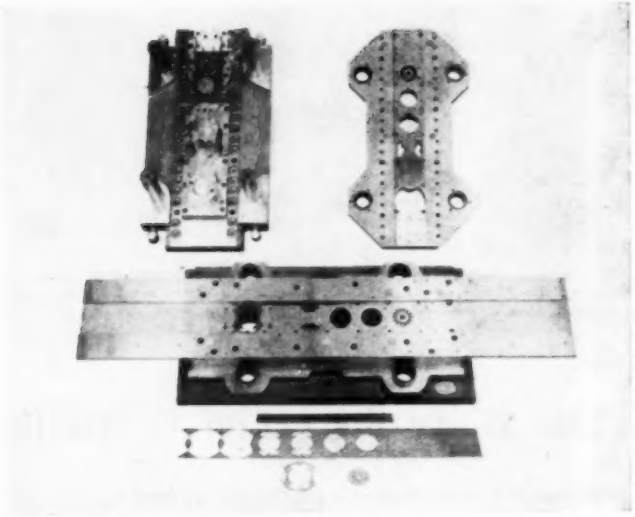
Similar tests on ⅛-in. stainless with 10-lb pressure showed that strapping would cut 8.5 in. per min; saw bands 32.7 in. And for 15,696 in., the cost was $153.85 for strapping, against $40 for the saw.

Band saws were ¾ in. wide, 10 pitch, 0.055-in. set, 0.038-in. gage. Plain steel strapping was 0.035-in. gage.

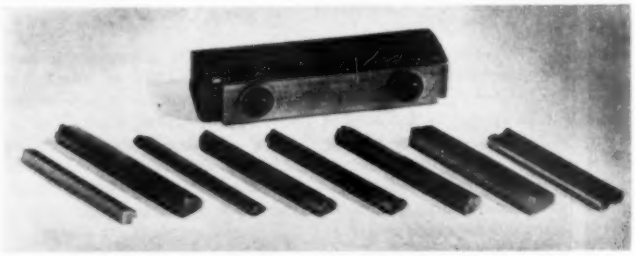
All tests were conducted on a Contour-matic machine, with specially constructed ball-bearing cut-off feeding device equipped with weights suspended from a cable riding over a pulley attached to the back of the standard feed table. The standard table was positioned so the burr created would not hang up on the back of the saw-slot opening. After each cut, the burr was removed from the remaining stock to permit checking squareness and straighness of cut.

BY FREDERICK C VICTORY
Chief Engineer
MOORE SPECIAL TOOL CO, INC
Bridgeport, Conn

Although irregular contours in tools such as dies, form cutters, and broaches are often merely stoned or polished after hardening, greater accuracy and longer life are obtained by grinding. In this first of two articles, Mr Victory explains why and how . . .



COMPLICATED DIES having combinations of linear and enclosed contours make accurate contour grinding a necessity



LINEAR FORMS, having exposed surfaces, are quickly contour ground in multiples

PRECISION CONTOUR GRINDING MAKES BETTER TOOLS

In many cases, complete grinding of hardened tools such as dies, punches, gages, form tools, and broaches is necessitated by the quality standards of the work they are to perform. This is particularly true in die work where the relationship of the punch, stripper, die and shedder must be held accurately so that proper alignment, clearance, and high production will be assured. Simpler portions of such tools are invariably ground because it is easy as well as desirable to do so, however, irregular portions or contours are often merely stoned or polished after hardening.

The assumption that contour grinding adds considerably to the cost of a job is true under certain circumstances, and in some classes of tools, such grinding is unjustified by pure economics. Several factors must be considered in arriving at a decision in this respect:

1. **Interchangeability.** Considerable advantage can be gained from interchangeability, particularly in certain types of lamination dies

where form grinding makes all punches and die sections in any one station identical. This cuts assembly time by eliminating the need for selecting, stoning and fitting individual pieces in spite of the close clearance between punches and die. Equally important is the assurance that duplicate replacement parts can be provided in case of breakage from misfeed or any other accident, a service of considerable value to the user of the tool.

2. **Longer tool life.** Service life is increased greatly by grinding because fits are more accurate, alignment is assured and surface finish is improved. Full advantage of the quality of the steel is obtained by grinding the few thousandths of decarburized, soft skin resulting from hardening; thus a surface of maximum hardness and wear resistance is attained.

3. **Freedom of design.** Frequently designs are modified to the detriment of strength and performance of the tools in order to avoid form grinding. For example, carbides are often avoided even though they may be an ideal material choice for certain tools because contour-grinding equipment and know-how is usually required.

4. **Cost.** In a number of instances unwise choice of equipment and lack of proper technique have fostered a false impression of the cost of grinding contours to dimensions. As a matter of fact, efficient contour-grinding equipment is so versatile that it can easily be kept in constant use even when not employed in actual contour grinding. Not infrequently, the cost of a partially ground tool will be compared unfavorably with that of an all-ground contour tool. This may be a valid comparison, but more often, paying a little more for a tool will gain a great deal in quality, productivity, and life. Increasingly keen competition is making the best tool the best investment; contour-grinding facilities can produce the best tool at the lowest cost.

5. **Lack of familiarity.** Difficulties with contour-grinding jobs can often be traced to failure to keep abreast of the latest developments in this rather specialized field. It is quite natural that there would be considerable reluctance to undertake a new operation requiring a capital expenditure for equipment without a comprehensive study of all aspects of the techniques and a survey and comparison of available equipment.

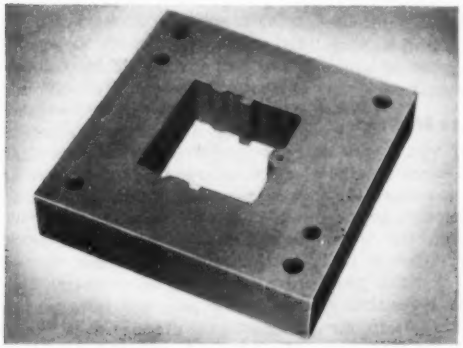
Types of Contours

The two basic contours are linear and enclosed and may be considered as independent and entirely different. Linear forms are usually open or have an exposed surface and can therefore be ground by several methods on a variety of machines ranging from conventional surface grinders with contour-dressing features to special-purpose contour grinders of various types. They lend themselves to multiple loads when aligned end to end on a chuck or fixture—a great economy when a number of identical parts are required. This practice naturally produces a uniform contour on the entire load. When draft or taper in all directions is required, as in die work, each section must be set up in a special tilting fixture and ground individually as a final operation.

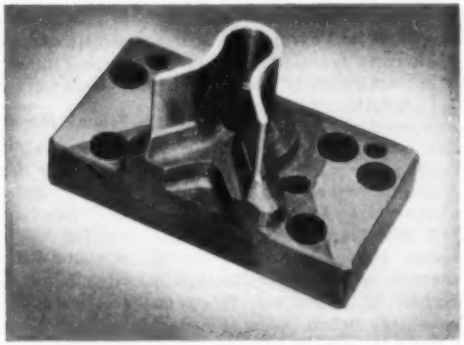
An enclosed form or contour is the inside surface of an opening and obviously requires entirely different grinding methods and equipment than the linear form. The most efficient way of grinding contours of this type is with a contour model jig grinder. Naturally there are borderline cases in which the contour may be ground by either method; typical of this is the limited form in which the form itself is linear, but instead of running the length of the piece, blends into a flange.

Linear Form Grinding

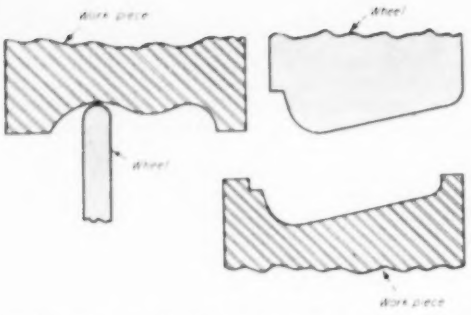
A grinding wheel produces contours by either of two basic methods, generation or duplication. Generation produces a contour by relative movement between wheel and work, independent of the shape of the wheel. In the duplication method, the wheel itself is dressed to the shape necessary to grind the desired form into the work. Because each method has advantages for certain types of work, a number of linear form-



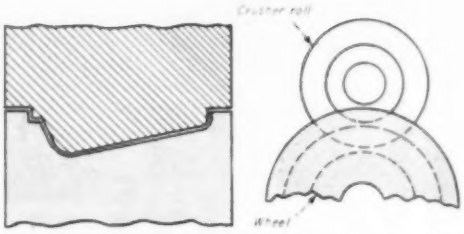
WHILE IT IS POSSIBLE to make sections of enclosed forms and treat the individual parts as linear forms, it is more often desirable to contour grind them as an enclosed contour in a solid piece. In this way a stronger part is produced at less cost



THIS PUNCH is an integral part of the flange, providing maximum strength and is contour ground in a jig grinder. Good surface finish, a close, accurate fit with the die, and full advantage of the quality of the steel is thereby obtained



FEMALE RADII in a workpiece are generated by movement of the wheel having a radius smaller than that to be ground (left). Contour dressing of the wheel (right) produces the highest fidelity of detail and accuracy



ONE OUTSTANDING ADVANTAGE of wheel crushing is the ability to produce sharp internal corners on the wheel form. Wear on the crusher roll is not excessive

grinding devices have been developed around each of these methods of contour grinding. Because a linear form is an exposed surface, it is quite natural that linear form grinders are modifications of surface grinders or at least duplicate their basic movements.

Generation of Forms

It is possible to generate a contour on a conventional surface grinder, working to a scribed layout on the piece itself. This requires manual coordination of cross and down feeds while grinding, and cannot be done with a high degree of accuracy because of difficulty in observation. A means whereby the operator could observe a layout and see "tenths" while manipulating the controls would vastly improve the accuracy potential.

Two types of machine have been developed around the principle of visual guidance from an optically magnified and projected layout.

All three types have a number of characteristics in common:

1. Accuracy is dependent on the coordination of visual perception and manual control of the contouring movement while grinding. A high degree of skill on the part of the operator is necessary.

2. Wheel form need not be accurate, but in most cases should conform approximately to certain portions of the contour. This is an advantage when using diamond wheels on carbide.

3. Actual grinding of the contour is done by increments so perfect blending is difficult.

4. Accuracy is limited by the inability of the eye to determine unfailingly the exact point at which the line and the ground surface coincide.

5. Flexibility of the setup and movement makes possible the grinding of a variety of complex forms.

6. Repetition of accuracy is difficult because there is no templet or master to retrace.

One type of visual guide machine has a magnifying, optical projector added to a standard surface grinder. The optical system is mounted to travel with the table, thus keeping the workpiece constantly in focus. As a result, the surface being ground is projected on a screen which also carries a large-scale accurate layout of the desired contour. By this means it is possible to grind the work until its contour conforms with that of the layout on the screen. The machine is suitable for multiple-piece loads, and in addition, may be used for ordinary grinding when there is no contour work to be done.

Wheels Move—Work Stationary

A second type of visual guide machine is based on essentially the same optical system, except that the contouring movements are restricted to the wheel, the work remaining stationary. One of the advantages claimed for the projection-type machines is the ability to inspect the work right in the machine, both while grinding and after completion. This is convenient in many types of work, although in some cases it is difficult to equal physical measurement for the highest accuracy of final inspection. Although no templet is required in the projection machines, the large, accurate layout presents just about as much of a problem. This is acknowledged to the extent that a layout machine is considered a necessary part of the setup by one manufacturer.

The third machine of this type differs significantly from the first two mainly in the type of visual guide presented. Contrasted with a "blown-up" layout and image of the work, this machine provides the operator with a "target" of cross-hairs in the field of a microscope as a guide. Movement of this microscope is governed by a pantograph from a large-scale drawing of the desired contour. Because the contouring movement of the wheel is manually controlled and because the field of vision through the microscope is limited to a small area, grinding and movement of the target 'scope must be accomplished in a series of incremental steps, until the entire contour has been completed. Under favorable conditions it is probable that an accuracy of somewhat less than 0.0005 in. can be attained in an average number of different forms.

Still another machine, designed to generate and grind linear forms, depends on a guide, but in this case it is a templet or master. Following the enlarged form on the templet with a stylus on a pantograph linkage causes the wheel to reproduce the desired form in a reduced scale on the surface of the work. Advantages include greater

assurance of duplication and less dependence on operator skill. It is less suitable for carbide grinding because the wheel must be accurately dressed to the same shape as the stylus, a serious problem with diamond wheels. Length of contour is limited to about 2 in. in this particular machine, precluding multiple-piece grinding of any except thin sections. One feature of this machine is the adjustable ratio of the pantograph linkage, permitting choice of the most suitable templet size compatible with desired accuracy.

Matching Contour Method of Contour Grinding

Although all methods of linear form grinding involve the process of generation at some stage of operation, the matching contour method of form grinding differs significantly from direct generation previously discussed. In matched contour grinding, the wheel is dressed to a shape which produces the desired form. In this way it actually performs the function of a form tool. This analogy can be amplified by pointing out that the same reasons for which a form tool is chosen in preference to a single-point tool, in many instances, can be equally applicable in the selection of the matched contour method as compared with direct generation. These reasons include greater accuracy of repetition, less dependence on operator skill, higher productivity, and better finish.

Diamond vs Crush Dressing

There are two accurate ways to produce a form on a grinding wheel. One is to dress it with a diamond tool; the other is to crush it with a form tool called a crusher. Both should be examined because of their influence on design, operation and performance of matched-contour form-grinding equipment.

It is important to understand the circumstances leading to the use of crush dressing. In general, the conventional use of a diamond as a dressing means has the serious limitation of cost. The relatively high price and short life of diamond tools in some instances proves to be uneconomical. In the search for alternative means, it was found that a form on a cylindrical roll could be accurately transferred to a grinding wheel by slowly rotating one or the other while bringing them in contact and gradually forcing the roll into the periphery of the wheel under pressure. In this way the bonding material of the wheel is progressively crushed, releasing the abrasive particles until the wheel conforms to the contour of the roll. A variation of this idea employs a linear form on a crusher bar which can be set on the chuck of a surface grinder, and by slowly feeding the non-rotating wheel forcibly down upon it while reciprocating the table, a result comparable to roll crushing will be obtained.

Advantages and Limitations

Wheels may be crush dressed repeatedly without noticeable wear to the crusher. As is to be expected, however, unforeseen advantages and limitations became apparent with use. A marked difference in the grinding action of crush and diamond dressed wheels was noted. The former tends to remove stock more rapidly and generate much less heat in the workpiece. This is an advantage when roughing, and particularly in grinding slender sections subject to distortion. Diamond dressed wheels produce a much better finish and greater fidelity of delicate or intricate contours.

This difference is largely a result of the grinding surface of the wheel produced by each dressing method. A diamond tool dresses a wheel by simultaneously cutting away the bond while shearing or cleaving each abrasive particle in its path. The result consists of a virtually smooth surface composed of an infinite number of flat or plateau shaped abrasive grains nearly flush with the surface of the bond. In contrast with this the crushing action pulverizes the bond to a certain depth, and loosens projecting abrasive particles so that the resulting wheel surface consists of a somewhat smaller number of sharp particles of abrasives, the points of which conform to the contour and project above the bond slightly.

Since grinding is clearly a cutting action, using each abrasive particle as a tool to remove a tiny "chip" in the form of grinding dust, it will be apparent that the flat and duller particles resulting from diamond dressing will not cut as freely, and will produce more heat as a result of the rubbing action, as contrasted with the sharp particle in the more open structure of the crushed wheel.

Generation in all Form Grinding

As previously stated, the principle of generation enters into all methods of form grinding at some stage. In diamond dressing a contour into a wheel, preparatory to linear form grinding by the matched-contour method, the form is actually generated by the movement of the diamond. Should this same form be crush dressed, the generation would be one step farther removed, that is, in the making of the crusher itself. In the case of a roll crusher, this may be during the lathe-turning operation or by grinding after hardening.

In Mr Victory's second article, equipment for the formed-wheel method of contour grinding will be described, together with the ways in which it is used.

"How the hell . . . ?"

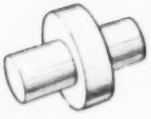
DEEP-JAWED RESISTANCE WELDING GUN spotwelds stringers, longerons, and supporting members of P2V-5 "Neptune" nacelle barrels manufactured by Solar for Lockheed. Barrel is made of half to full-hard 301 stainless steel with 185,000 psi minimum tensile strength. Stringers alone (64/barrel) require 7680 linear in. of attachment, totaling nearly 20,000 individual resistance welds. Specialized guns were developed by A P Seedorff Co and Solar welding engineers

Solar Aircraft Company

SHOP SHOTS

REVOLVING WORKTABLES in arc-welding booths streamline production of exhaust manifold sections at Solar's San Diego plant. Handler loads fixture on one side of table while operator works in his shielded booth. No parts handling is required of welder. Shield protects loading operator, has window for visibility

Solar Aircraft Company

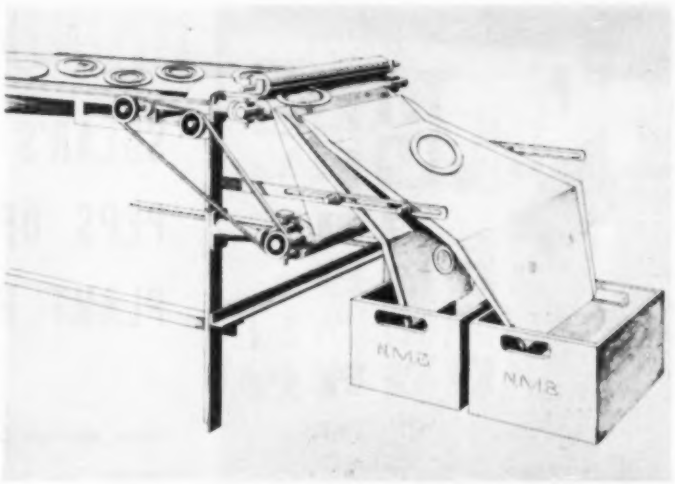


CASE HARDENING of wear surfaces on rivets for chain of McCulloch power saw is performed in automatic induction heating setup. Rotary hopper aligns rivet with magazine which feeds it to loading position. Plunger grips rivet and advances it to vacuum holding fixture. Air blast ejects rivet on pretimed cycle. Plunger and air are controlled by double cam at left. Setup is specially designed to permit continuous operation of heater. Operation takes less than 1 sec

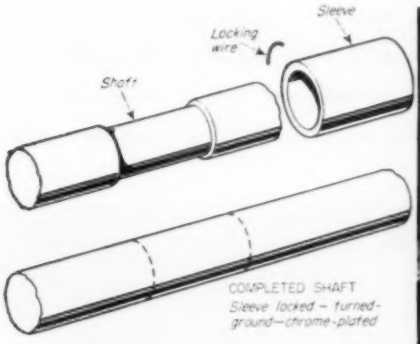
McCulloch Motors Corporation

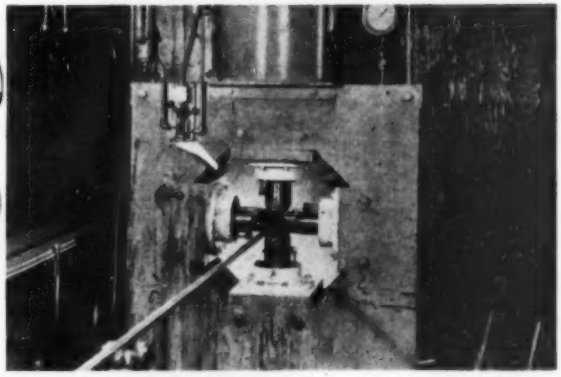
AUTOMATIC SORTING of different-sized washers is accomplished by two rollers mounted on the end of conveyor. The larger the washer, the further it extends from the rollers before dipping downward. Chutes complete the separation. Device was invented by an employee, Mrs Lois Piper

National Motor Bearing Co, Inc



BEARING SURFACES ON PUMP SHAFTS must be hard finished to resist wear or abrasion caused by sand and water pumped from deep wells. So, stainless steel sleeve is anchored to shaft by squeezing sleeve into undercut with wire positioned lengthwise between sleeve and shaft. Wire firmly imbeds in both sleeve and shaft. Sleeve subsequently is turned and ground to shaft size, then is chrome plated. Before using wire, sleeves tended to loosen. Welding introduces local stresses and pins weaken the shaft. Hence, the wire locking method. ▼





▲ **COMPRESSION REDUCING PRESS** develops approximately 30 tons pressure to lock sleeve to shaft. Pump supplies four pistons that equalize in their application of pressure. Piece is squeezed, rotated, squeezed and so on until operation is complete. Sleeve is chamfered on ID, is shorter than undercut initially, but lengthens to fill complete during reducing operation

Peerless Pump Division, Food Machinery & Chemical Corp

◀ **MILLING OPERATION** is performed in special setup on standard drillpress. Operation mills slight flat on cutting tooth of chain for power saws. Quick-acting fixture is loaded in position shown, then rocks forward under cutting edges. Fixture supports spindle during milling operation.

McCulloch Motors Corporation

SOLAR'S "DOGHOUSE" PEPS UP PLANT HOUSEKEEPING

Solar Aircraft Co. rates departmental housekeeping and publicizes housekeeping performance. New photographic feature was instituted by Plant Supt W E Ragsdale. Over-all program plays an important part in maintaining safe working conditions at Solar's San Diego plant

HOUSEKEEPING BULLETIN BOARD contains photos of safety hazards or messy work areas. Ship-shape departments display the Solar triangle. Boards are spotted where many people can see them

WEEKLY HOUSEKEEPING TOUR turns up conditions pictured on bulletin board. Photographer makes unscheduled plant tour with foreman who goes over every department with fine-tooth comb. Looked for: untidy work areas, hazardous conditions, safety violations, wastage of material. Foremen are merciless in their evaluations, as different foreman makes tour each week and must vie for superior record in his own department when fellow-foreman makes tour the following week

"DOGHOUSE" BANNER must be displayed by last-place department after once-a-month inspection by general housekeeping committee, cooperating with safety department. All departments are point-rated for safety and clean working conditions. Results are posted throughout plant. Top department receives Solar triangle banner. Happy supervisor has just gotten rid of "doghouse," which is bright neon, visible a building away. Man with back to camera is sharing current month's shame

ROUND TABLE

Who Rates the Boss?

"This one is going to knock you for a loop, Ed," laughed Al. "Wait'll you see my new foreman-rating cards to be filled out by the men."

"What!" exploded Ed. "You mean to tell me you're having the men put down what they think of you?"

"Why not, Ed? I'm only human, you know—may be doing something wrong."

"I'm getting to think you're a cockeyed human at that. Remember, man, you're a foreman. You rate the men; they don't rate you."

"You mean I'm above rating? Is a foreman any better than the men who work under him?"

"That isn't the point. The thing I'm thinking of is the effect it will have on the men. You know yourself, Al, that once you give in to them you're sunk. They'll take advantage of you and be wanting to dictate on the amount of salary you should be getting."

"I think you're making a mountain out of a molehill; it only gives them a chance to express their views and, believe me, you can learn a lot from their gripes."

"You'll learn all right, Al; you just wait and see!"

"Most of the workers are square thinkers and you can depend on them to be serious in their appraisal."

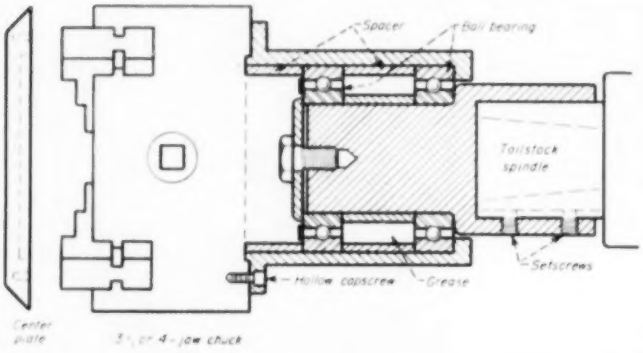
"Any time any of my men think he can pick flaws in me I want to know it—I'll let 'em know who's who in my department!"

"Oh! We have a Hitler in our midst, eh! What're you trying to do, put yourself on a pedestal? Going to have one of those leafy crowns on your head like the oldtimers used to wear?"

"Nothing's going to be *on* my head, Al—it's what's *in* the head that counts. And you'd better check for rattles and squeaks in yours, before your crown turns out to be thorns."

SHOULD THE MEN *be asked formally to rate their bosses? Would some consider it "squealing"? Would such appraisals be honest—or a chance for gripes or favor-currying? Your ideas and opinions on this subject will interest others. Discussions on earlier subjects appear on later pages.*

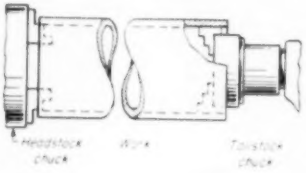
Practical Ideas



Tube-Turning Tool Tailstock Mounted

When the OD of tubing or pipe must be turned, faced, or chamfered concentric with the ID, holding frequently becomes a problem. Trouble increases when the piece to be machined is greatly out-of-round. One successful method of overcoming the difficulties is to build a free-floating, self-centering tailstock fixture. This will replace the clumsy and slow-adjusting "cathead."

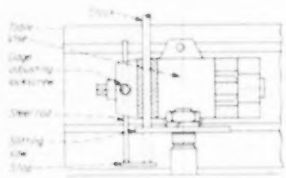
Essentially, the fixture consists of a free-rolling ball-bearing adapter which is clamped onto the tailstock spindle and which, at its opposite end, provides for bolting on a chuck or centerplate. Thus, with a 3- or 4-jaw chuck on both the headstock and the tailstock, pipe can be held true for turning. Thin walled tubing or pipe can be faced and centered by allowing it to extend a short distance over the chuck jaws. Then, the chuck can be removed, the hardened centerplate mounted, and the job turned on this free-running ball-center.

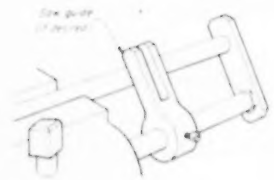


On our fixture the chuck is drilled and tapped for four socket head cap screws which pass through the back-up plate to hold the chuck to the adapter. For some chucks, the screws would have to pass through the chuck and into the back-up plate.

The hardened center plate is made to fit the back-up plate in the same way as the chuck. It is only necessary for very thin-walled tubing.

When turning thin-walled tubing, we found that the pressure of the chuck jaws caused a slight out-of-round condition. To overcome this we faced the tubes to length and chamfered them on the chuck arrangement, then removed the chuck, mounted the centerplate, and turned the tubes to size. No lubricant is needed between the tube and the centerplate as the ball-bearings provide a free-running action. The fixture was originally designed for a 6-in. dia pipe 41-in. long that we were required to face, turn, and counterbore on each end, meanwhile maintaining closest possible concentricity and a tolerance of 0.003 in. on all turned surfaces. The pipe was so far out-of-round that the use of a steady rest to face and center for a pipe center was out of the question. *Floyd Geltz, York, Pa.*

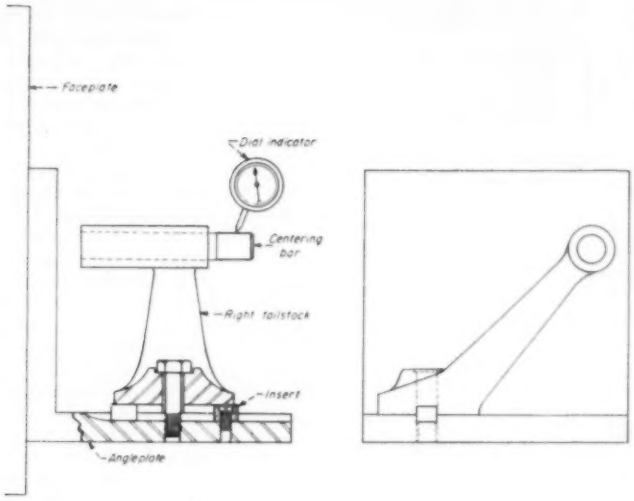




Precision Cutoff Attachment

When other cutoff equipment is tied up, the milling machine can be converted readily to the job of producing large quantities of pieces to identical lengths. The device shown makes this operation possible. It consists of a machinists vise with stock-stop which mounts on the miller table, and a slitting saw which is driven by the miller. A special cutoff machine could be built in which the vise-fixture was clamped to a table and the slitting saw was mounted directly on a motor.

The fixture consists of a conventional adjustable bench vise which has a horizontal hole drilled through the movable jaw to fit the rod which locates the stock-stop. A vertical hole is drilled and tapped in the vise for a lockscrew to clamp this rod at the desired length. To provide the stop, a flat bar is welded to the end of the gage rod. With an air-operated vise, the operation can be made semi-automatic. A saw guide may be used to keep cut straight. *Walter Lackner, Tyrol, Austria*

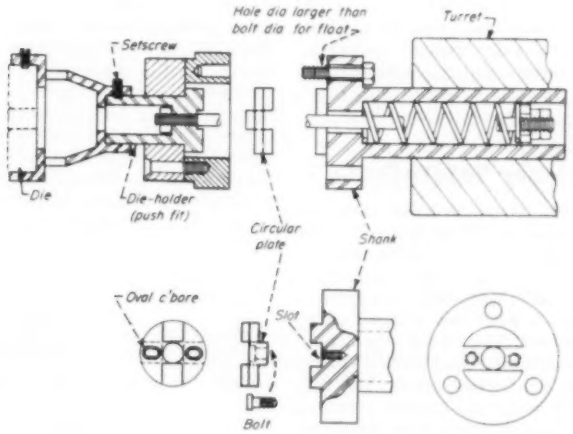


Line-Boring Tailstock

When a tapered hole must be bored in a new left-hand tailstock (for a tool-grinder) so that it is concentric with the original right-hand tailstock, try the following method:

Mill a slot as wide as the slots on the bottoms of both tailstocks in one inside face of a standard angle plate. Then make two inserts to fit this slot and fix them in the slot to locate the work. Fasten the external face of the other arm of the angle plate to a lathe faceplate, mounted on the lathe's spindle. Place the original right-hand tailstock on the angle plate as shown, having its bottom slot just fit the inserts, and clamp the tailstock to the angle plate. Make a taper centering bar for this tailstock, insert it into the hole and, using an indicator, true the bar to center.

Next, remove the original tailstock and clamp the new one in its place, locating it on the inserts; then drill and bore. The tapered hole will be exactly in line with that of the original tailstock. Balancing weight should be added to the face-plate to prevent throw and tool chatter. *C Y Lee, Taiwan, China*



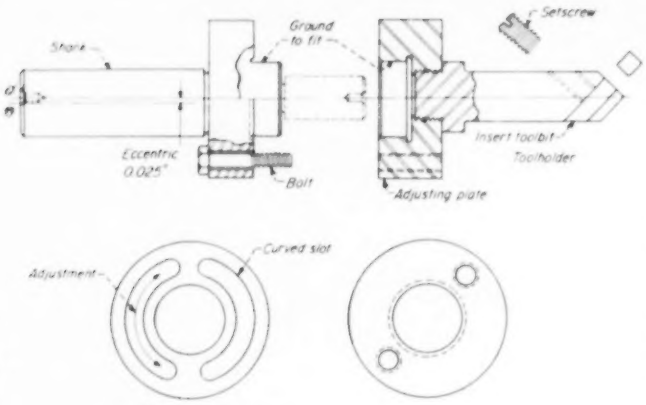
Homemade Floating Diehead

A self-releasing diehead for turret lathes, that includes a floating action to correct for slight misalignment between work and die, or between spindle and turret hole, can be very simply made.

The design calls for a circular plate which serves as both a clutch and a coupling. This plate has two rectangular ridges on each face to fit slots on the shank and the die-holder respectively. It is fastened loosely to the shank by three bolts.

For setting-up, loosen the two larger bolts used to hold the shank and the die-holder together and advance the turret until the die engages the work about 1/8 in. Now, as the die with its holder can float within the clearance between the large bolts and their respective bolt-holes, relative to the shank, the die will assume a position exactly in line with the spindle axis.

Tighten these bolts and continue threading until the turret reaches the pre-set stop. The die, with its holder, will be pulled out and rotate with the work when the slot on the die-holder disengages the circular plate. When the operator reverses the spindle, the die will return to its original cutting position. The three smaller bolts assure a uniform length of thread. *C Y Lee, Taiwan, China*

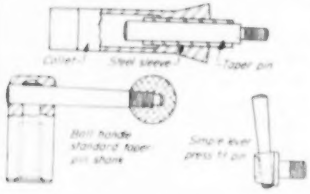


Eccentric Boring Head

A useful boring head, utilizing the eccentric principle was made in our shop for use on a die sinking machine, or on our vertical millers. The tool shank (centerline 0) is turned about 0.025-in. eccentric with respect to the driving head (centerline 0). The toolholder is screwed into the adjusting plate which has a hole accurately ground for a slide fit with the projection on the driving head, which is also ground. Two bolts are used to fasten the assembled toolholder and adjusting plate to the driving head, in which two curved slots are milled to clear the bolts when the adjusting plate is turned.

To set the boring size, loosen the two bolts and rotate the adjusting plate around the projection on the driving head to the desired size, then tighten the bolts. As the adjusting plate is rotated, the distance between the toolholder axis and the shank axis will change, hence the size of the hole can be varied. Lines may be inscribed on the adjusting plate and the driving plate to indicate size, but then the toolbit slot must always be in the correct position. A toolholder must be made for each hole size required. The dotted-line portion of the driving head is left in place for accurate grinding; then cut off. *C Y Lee, Taiwan, China*

Taper Pins Handles



We build a variety of small machines. Instead of machining special handles and levers for the various locking and adjusting screws, it has proved more practical to utilize taper pins. With only a simple turret-lathe operation we produce a quantity of these and stock them for use on six different machines. The same levers work equally well for locking devices on jigs and fixtures.

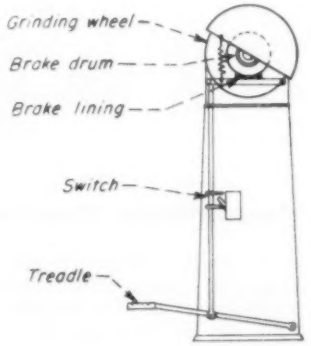
Taper pins are cheap and readily obtainable in a number of sizes. The taper gives them a neat and clean appearance, as well as simplifying assembly by permitting a drive fit into the screw or clamp.

The only machining required is turning and threading one end of the pin. A special sleeve was made to hold the pins in a standard collet for this operation. For some handles, we thread the small end of the pin and fasten on a plastic or steel ball. Simpler lockscrews are merely drilled, taper reamed, and the pin is driven into place. *H J Gerber, Stillwater, Okla*

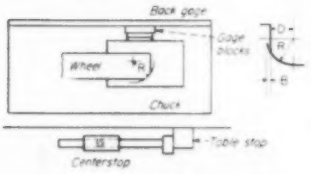
Grinder Safety Brake

Double-wheel pedestal grinders are used in almost every shop for sharpening tools. Usually, this machine serves a group of machinists who use it frequently, but for only a short time and intermittently. Many accidental injuries have been caused by pedestal grinders which ran, unattended, after the user finished his job. These accidents are largely a result of either the operator neglecting to turn off the machine motor or the wheel inertia continuing rotation after the motor has been switched off.

By interlocking a brake and a switch and tieing these into a foot treadle, as shown, these accidents can be minimized. A metal brake-band is mounted on the shaft, between the motor and the wheel. A brake-shoe, complete with lining, is spring-loaded to constantly apply pressure to the band; thus brake the motor. A treadle is connected to the brake-shoe by a connecting rod. Suitable fingers on the connecting rod actuate the motor switch. Depressing the treadle releases the brake and energizes the motor switch. When the treadle is released the motor is switched off and then the brake is applied. *Haim Murro, Boston, Mass*



Non-Tangent Radii On Simple Dresser

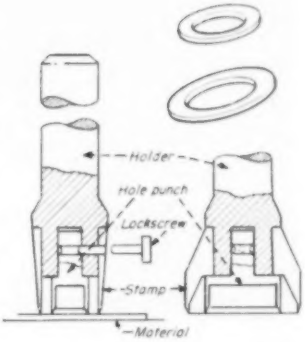


When only a simple grinding wheel radius dresser is available, radii which do not terminate in a tangent can be dressed accurately. If the radius is tangent to the face of the wheel, but not to the side, the base of the radius dresser is located against the back gage-stop of the magnetic chuck. Then, the diamond is brought into contact with the side of the wheel to establish a location. A gage block equal to the difference (B) between the radius (R) and the depth (D) is used as a spacer between the edge of the base and the back gage-stop, to bring the center of the arc into its correct position (B = R–D).

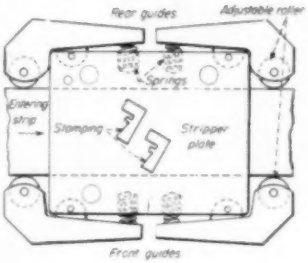
For an arc that is not tangent to either face or side, a stop-block is mounted on the magnetic chuck to help establish a position relative to the wheel face and the above procedure is repeated. The technique, which can be used for both concave and convex dressing, is simply to locate the arc center by touching either, or both, the center or the side of the wheel with the diamond in its correct angular position. Then, use gage blocks to shift this position. *E C Jacobs, Chicago, Ill.*

Washer Punch

Frequently it is necessary to make washers or rings from cardboard, rubber, leather, cork, lead, or similar soft materials. Unless the punch is properly made, it may crush, tear, or leave rough edges on the rings. The punch shown is designed to produce a ring in one operation, with the hole precisely centered in the material. Also, the punch and stamp are interchangeable for varying dimensions. *Hermann Voss, Hanover, Germany*



Ball-Bearing Stock Guide



A recent job called for a blanking die having a tolerance of less than 0.0005 in. from the edge of the blank to the center of the hole. When the usual hardened pin guides were used, it was found that the stock required more movement than the pins permitted, as rolled stock averaging 0.015 in. thick frequently is snaky.

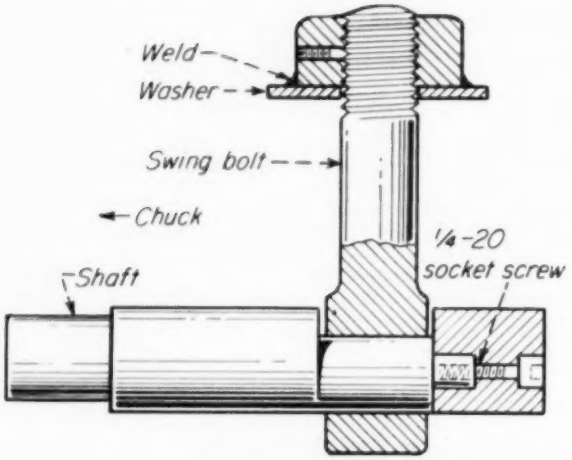
When a hitch feed was used, there was resistance to the stock going in, or to the sides, because of curves in the stock. Whenever the locating pins entered the holes under pressure, the blank was punched with a twist. The ball-bearing guide was designed to eliminate this resistance and to permit the stock to move easily in any direction. With it, the tolerance was readily held.

The guides are attached to the stripper plate so that they will follow the die down as it is reground, hence the stock will always be in the center of the guide roller. When the die is ground flush, or worn out, countersinks can be put into the lower casting to clear the bearing. The rear springs, as shown, are 1/3 stronger than the front springs, thus the stock is bottomed solidly against the front guide

When the stock has an unusual curve the back set of guides will move in that direction with the front set following. As the irregular portion of strip passes through, the heavier springs in the back set of guides will return the stock to its normal position. When the blank pattern includes the edges of the strip, thus making the edge uneven, only the entering guides should be used. *Jos E Shepperack, Norristown, Pa.*

Sharp Pencils

Don't junk those old fine-grit grinding wheels! When they chip, break, or wear too small, your draftsmen can use them as pencil sharpeners. The abrasive surface and relatively heavy weight of the wheel enables the draftsmen to easily and accurately sharpen his pencil, using only one hand. A worn or broken grinding wheel at each man's board provides a permanent, work-saving sharpener—and saves the cost of special emery boards. *John Beck, Chicago*



Cam-Latch Speeds Steadyrest Loading

In shops where steadrests are used frequently or for long production jobs, opening and closing the swing-bolt for loading and unloading can be time-consuming and costly.

To beat this time loss we added a cam to the swing-bolt pivot. The original nut was locked by drilling a hole in it and tapping it for a ¼-20 set-screw. Ahead of the set-screw we inserted a piece of brass, notched to seat on the swing-bolt thread. Thus, you can adjust the nut as necessary and lock it without damaging the thread.

The pin through the swing-bolt was 1-in. dia so we bushed the swing-bolt to 0.687 in. and machined a cam 0.687 in., flush with one side of the 1-in. shaft. Then, we turned a pin on the cam to hold an extension of the 1-in. shaft. The extension was made with a hole drilled, at the same setting as the cam, to fit over the prepared pin. The two pieces were joined with a ¼-20 capscrew, thus producing the equivalent of a solid shaft. This part is assembled when the swing-bolt is placed on the steadyrest, (but align the extension carefully to ascertain that the shaft is free-running).

By welding the washer under the nut on the steadyrest to this nut, we produced a single unit. On the chuck side of the steadyrest, we applied a pin to the shaft to serve as a handle. This pin was ⅞-in. dia and included a hub so that it could be setscrewed and readily positioned by the operator.

To operate, the handle is adjusted so that it is in the clamping position when straight up. When released, the cam action pulls the swing-bolt and the upper portion of the steadyrest. Pulling the lever is the only move made by the operator. Formerly we did 60 pieces in 9 hr, now we do at least 80, hence the improvement is well worthwhile. *O O Kilbourn, Montibello, California.*

Stop Jaw Creep On Cam-Lock Vise

The movable jaw on some cam lock vises creeps back as the vise is opened and closed frequently. This makes it necessary to constantly adjust the movable jaw when the vise is used for a large quantity of parts. Clamping a stop in position, on any of the three guide rods, to limit the jaw travel so that the jaw opens only enough to remove the work will eliminate this difficulty. The two piece stop is steel. *J. C. Magee.*

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PRACTICAL IDEA

in

July 7, '52 Issue

is

N F Kfoury

Fixture Grips Round Collars

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

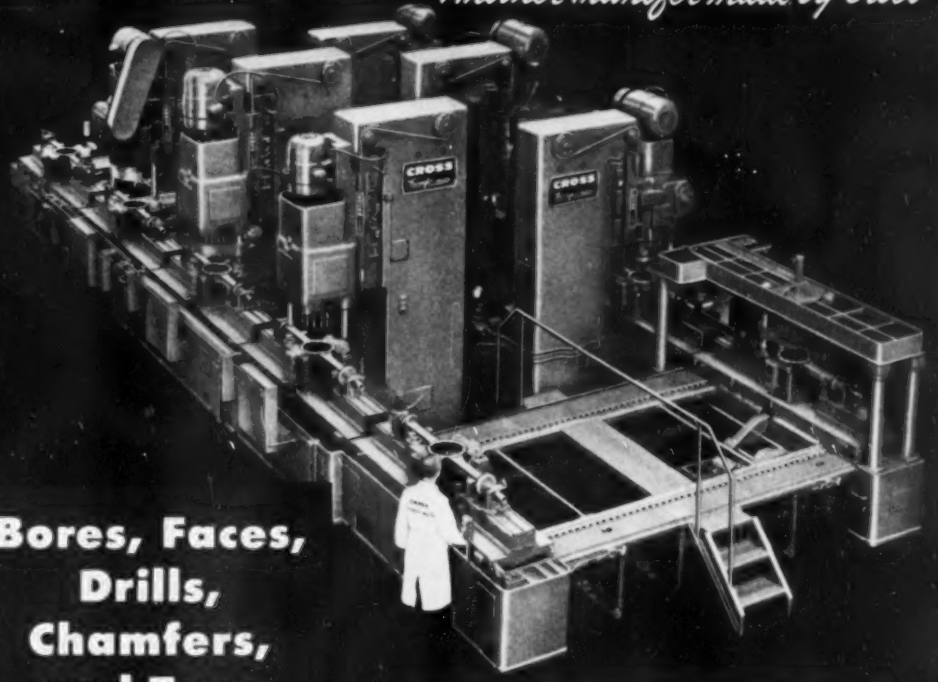
JUDGES— A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER – Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 36, N. Y.

Another Transfer-matic by Cross



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American Machinist REFERENCE BOOK SHEET

Toolroom Heat-Treating Equipment ...I

These data are used in the automotive industry

The following information was developed as a guide for the selection of toolroom heat-treating equipment in normal manufacturing-plant operations. The suggestions were developed as a result of conferences and represent those pieces of equipment considered suitable for satisfactory operation. A relative rating chart is also included to indicate the order of preference of the equipment where it is necessary to choose between several devices.

Semi-Muffle Furnace

General Use: Pack carburizing, general-purpose hardening, normalizing, and annealing; either by the pack method or in an oxidizing atmosphere.

Suggested Size: Hearth 24 in. wide by 36 in. deep for the smallest unit, to 48 in. by 60 in. for the large toolroom.

Heating Source: Gas, oil, or electric resistance elements.

Refractory: 2800 F high-quality insulating firebrick is worth the additional cost over lower quality. Hearth tile should be first-quality Missouri fireclay.

Temperature Control: Chromel-alumel thermocouple in protection tube of Inconel or diffused aluminum-coated steel (not recommended for temperatures above 1700 F), located either in the arch two-thirds of the distance from front to back or in the back wall one-third the distance from hearth to arch.

Remarks: Doors should be well insulated and tight fitting to prevent heat loss and uneven temperature. Precaution should always be exercised in placing the load well back from the door opening.

Convection currents prompted by fuel firing aid in uniform temperature distribution.

In electrically heated furnaces, means for providing positive circulation by fans is desirable. Fan speeds should not exceed 1200 rpm. Any furnace equipped with fans should not be operated above 1750 F, unless fan unit is removed.

The load in the furnace should either be protected from direct radiation of the elements or means provided to reduce the kw input on the heating cycle at some point below the final process temperature.

Elements rated at 220-v or less are preferred to 440-v elements, because the latter require higher resistance in the element for a given heat output.

Partial control of furnace atmosphere may be secured adjusting fuel-air ratio in fuel-fired furnaces.

High-Temperature Furnace

1200-2000 F

General Use: Hardening (primarily high-speed and air-hardening steels).

1. BARIUM CHLORIDE (BACL$_2$) SALT BATH

Suggested Size: 10x15x18-in. deep ceramic pot.

Heating Source: Submerged electrodes or immersed electrodes.

Temperature Control: Radiation pyrometer with porcelain target tube. (Must be protected from temperature shock). Periodic checking with chromel-alumel thermocouple is recommended.

Remarks: Bath neutrality may be controlled by use of solid rectifiers or, in certain types of furnaces, with methyl chloride. Bath neutrality may be indicated by placing representative sample in bath for 30 min., quenching in appropriate medium and checking surface hardness with file or Rockwell superficial hardness tester. Carbon analysis of the surface layer indicates the condition of the bath.

2. GLOBAR FURNACE

Suggested Size: 12x24x7½-in. high work chamber. Silicon-carbide muffle.

Heating Source: Air-cooled-terminal globar elements.

Temperature Control: Radiation pyrometer located in the end of the work chamber of the Globar unit.

Remarks: May be used with protective atmospheres.

(A) Partially combusted gas (decarburizing but scale free).

(B) Charcoal gas (normally neutral up to about 1750 F, but decarburizing above 1750 F unless very pure).

(C) Dissociated ammonia (decarburizing at temperatures above 1100 F).

(D) Catalytically cracked hydrocarbon gas. (Permits close control of carbon potential.)

(E) Graphite blocks. (Some protection against scaling. For protection against decarburization, all work surfaces must be in contact with the graphite blocks.

3. FUEL-FIRED FURNACE

Suggested Size: 12x22x10 in. high. Silicon-carbide muffle.

Heating Source: Gas or oil.

Temperature Control: Radiation pyrometer in end of work chamber.

Remarks: May be used with protective atmospheres similar to the globar furnace.

Forge Furnace

2500 F MAX.

General Use: Heating for hot working.

Suggested Size: 12x18x10 in. high work chamber.

Heating Source: Gas, or air-cooled-terminal globar elements.

Temperature Control: Radiation pyrometer. Chromel-alumel thermocouple may be used for periodic checks in refractory protection tube, if so desired.

Moderate-Temperature Salt Baths

1300-1700F

1. NEUTRAL SALT (ALKALI CHLORIDES)

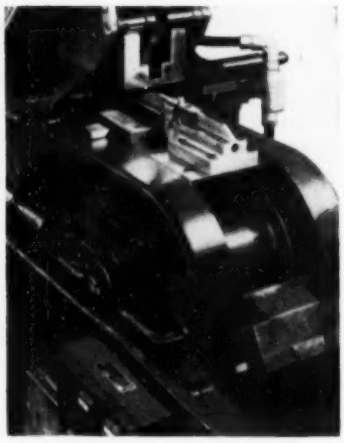
General Use: Neutral hardening.*

*Full-Muffle Furnace with Proper Atmosphere also Suitable

Continued on page 173

TO CUT MACHINING COSTS

machine faster with continuous broaching



• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Cutting tool maintenance costs are low. We will be glad to make our recommendations on Footburt Surface Broaching Machines based on our many years in handling similar work.

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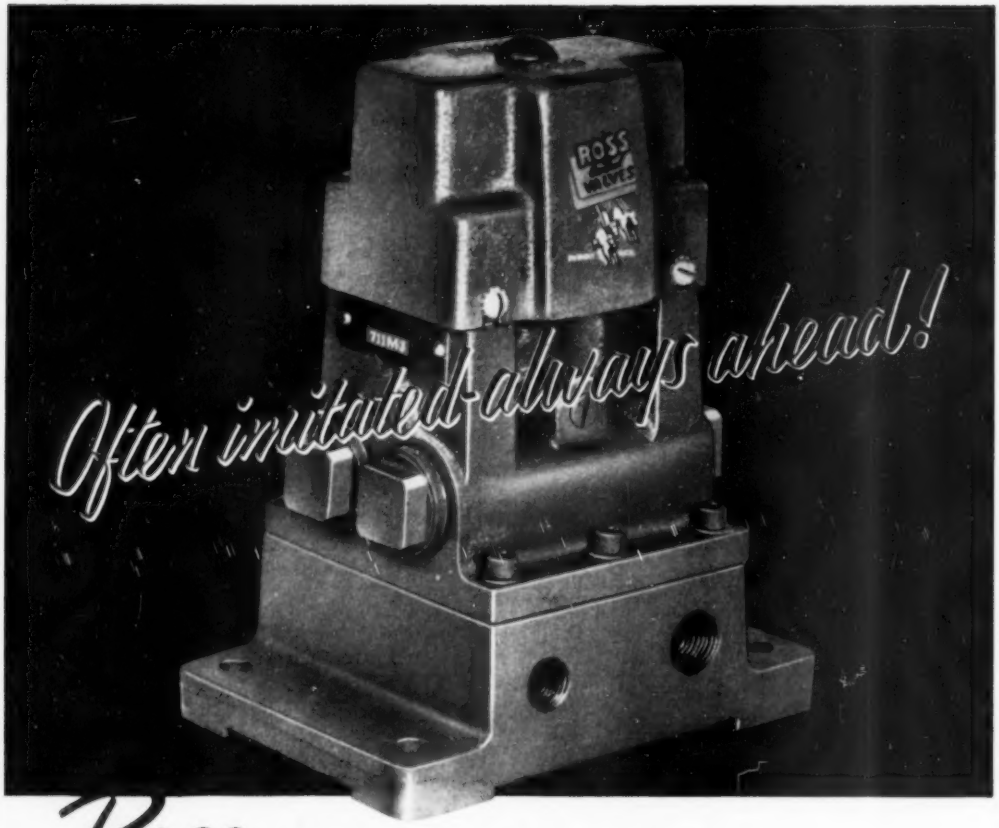
machine tools

Toolroom Heat-Treating Equipment ... II

RATING CHART FOR TOOLROOM FURNACES

Furnace	Heating Source	Fuel Cost	Maint.	Temperature Uniformity	Cleanliness	Venting Requirement	Initial Cost	General Preference
General-Purpose Semi-Muffle 1200-2000 F	Gas	2	1	1	2	2	1	1
	Oil	1	2	2	3	3	1	2
	Electric Resistance	3	3	1 or 3*	1	1	2	3
High-Temperature Hardening 1500-2450 F	Electrodes	3	2	1	3	4	3	1
	Globar Elements	3	3	3	1	1	2	3
Salt Bath, Semi-Muffle, or Muffle	Gas	2	1	2	2	2	1	2
	Oil	1	2	2	3	3	1	4
Forge 2500 F Max.	The rating for this type of furnace is the same as for high temperature semi-muffle type							
Moderate-Temperature Neutral Hardening 1300-1700 F Salt Bath	Electrodes	3	1	1	4	4	3	1
	Gas	2	5	1	5	5	1	3
	Oil	1	6	1	6	6	1	4
	Electric Resistance	4	7	1	4	4	2	7
—Or—								
Full Muffle with Atmosphere	Gas	2	3	2	2	2	2	2
	Oil	1	4	2	3	3	2	5
	Electric Resistance	4	2	3	1	1	4	6
Liquid Carburizing 1425-1750 F	Electrodes	3	1	1	1	1	3	1
	Gas	2	2	2	2	2	1	2
	Oil	1	3	2	3	3	1	3
	Electric Resistance	4	4	3	1	1	2	4
Liquid Cyaniding 1425-1600 F	Electrodes	3	1	1	1	1	3	1
	Gas	2	2	2	2	2	1	2
	Oil	1	3	2	3	3	1	3
	Electric Resistance	4	4	3	1	1	2	4
Preheat for High-Speed Steel 1100-1650 F Salt Bath	Electrodes		The rating for this type of furnace is similar to that for neutral hardening. The type of furnace selected here should match the choice of the furnace for hardening					
	Gas							
	Oil							
	Electric Resistance							
—Or—								
Full-Muffle with Atmosphere	Gas							
	Oil							
	Electric Resistance							
Liquid Nitriding 975-1100 F	Electrodes	3	1	1	1	1	3	1
	Gas	2	2	2	2	2	1	2
	Oil	1	3	2	3	3	1	3
	Electric Resistance	4	4	2	1	1	2	4
High-Speed Steel Quench Bath 950-1050 F	Electrodes	3	1	1	1	1	3	1
	Gas	2	2	2	2	2	1	2
	Oil	1	3	2	3	3	1	3
	Electric Resistance	4	4	2	1	1	2	4
Hot-Salt Quench 325-900 F	Electrodes	3	1	1	1	1	3	4
	Gas**	2	2	1	2	2	1	2
	Oil**	1	3	1	3	3	1	3
	Electric Resistance	4	4	1	1	1	2	1
Tempering Room Temperature to 1250 F Max.	Electric Resistance	3	1	1	1	1	2	1
	Gas	2	1	1	2	2	1	2
	Oil	1	2	2	3	3	1	3

*#1 Rating if equipped with fan. Otherwise #3.
**Either immersion type or externally fired.



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- *Low current consumption*—inrush of 1.2 amps @ 110/60
- *Positive seal* — poppet construction; Hycar seats
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ROSS OPERATING VALVE COMPANY

120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

Toolroom Heat-Treating Equipment...III

Suggested Size: 14x21x30 in. deep.
Heating Source: Submerged or immersed electrodes with ceramic pot, gas, oil, or electric resistance elements with plain steel or aluminum-coated steel pot.
Temperature Control: Chromel-alumel thermocouple in protection tube of Inconel or diffused-aluminum coated steel.
Remarks: Bath neutrality controlled in the same manner as the high-temperature bath, except SAE 1070 shim stock used for test purposes.
Suggested Size: 15x24x12 in. high muffle (silicon carbide or alloy).
Heating Source: Gas, oil, or electric resistance elements.

2. LIQUID CARBURIZING (CARBURIZING SALT) 1425-1750 F

Suggested Size: 16 in. dia. x 18 in. deep.
Heating Source: Immersed electrodes with steel pot, gas, oil or electric resistance elements with heat-resisting alloy pot.
Temperature Control: Chromel-alumel thermocouple with 27% chrome-iron protection tube.
Remarks: The carburizing rate of the bath may be determned by use of SAE 1020 test pieces.

3. CYANIDE BATH 1425-1600 F

All remarks same as for liquid carburizing bath.

4. HIGH-SPEED PREHEAT BATH 1100-1650 F

All remarks same as for neutral-salt bath. Size of bath should be about twice the size of high-temperature bath.

5. LIQUID NITRIDING BATH 975-1100 F

Suggested Size: 12 in. dia. x 18 in. deep. Steel pot
Heating Source: Immersed electrodes. Gas, oil, or electric resistance elements.
Temperature Control: Chromel-alumel thermocouple with steel protection tube.

6. HIGH-SPEED-STEEL QUENCH BATH 950-1050 F

Suggested Size: 10x18x18 in. deep. Steel pot.
Heating Source: Immersed Electrodes. Gas, oil, or electric resistance elements.
Temperature Control: Chromel-alumel thermocouple with steel protection tube.

Hot-Salt Quench Bath

325-900 F

Warning: Dangerous explosion will result from mixing nitrate-nitrite salts with cyanide salts. Nitrate-nitrite salt must not be used in conjunction with a cyanide bath. These two salts must be isolated and closely supervised against possible mixing of these materials.
Suggested Size: 18x24x30 in. deep. Steel pot.
Heating Source: Immersed electrodes. Resistance immersion heaters. Fuel-fired immersion heaters. Gas- or oil-fired externally.
Temperature Control: Chromel-alumel thermocouple in steel protection tube.
Remarks: Rapid circulation of salt properly directed is of prime importance. A three-blade impeller inside of a U-tube to direct salt flow yields satisfactory results.

Tempering Furnace

Room Temperature to 1250 F

1. PIT-TYPE RECIRCULATING FURNACE

Suggsted Size: 14 in. dia x 16 in. deep.
Heating Source. Ribbon or wire elements for 220v or less, gas, or oil.
Temperature Control: Chromel-alumel thermocouple located in lid of furnace. Protection tube not required.
Remarks: Gas-tight work chamber is necessary for use with steam or products of complete combustion.

Means are desirable for reducing kw input when approaching the process temperature.

2. BOX-TYPE RECIRCULATING FURNACE

Suggested Size: 18x30x18 in. high.
Heating Source: Electric ribbon or wire elements for 220v or less, gas, or oil (require external combustion chamber).
Remarks: Same as for pit-type furnace.

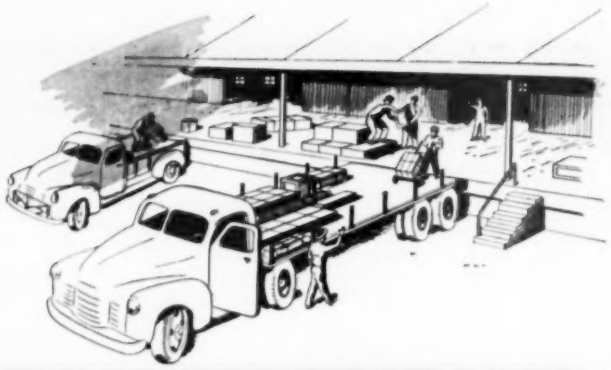
Accessory Equipment:

Automatic controlling and recording potentiometers are necessary for proper heat treatment. This equipment should be inspected daily and thoroughly checked at least once per week by an operator who has been trained for this work.

Rockwell C hardess test equipment should either be included in the equipment provided for a toolroom or should be readily available to those responsible for toolroom heat treating.

Quench tanks containing ample volume of water and oil and located near the hardening furnaces are essential to good heat treatment. The water tank should be provided with an overflow and a continuous flow of fresh water. The size of the oil tank will be governed by the volume of work processed. Oil temperature should be maintained at 100-130 F. Means should be provided for heating the oil to the minimum temperature. Also, circulating and cooling facilities should be provided if the volume of work requiring oil quenching is such that the temperature of the oil tends to exceed 130 F.

How to get Stainless Deliveries Now!



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Armco Stainless Steel Distributors maintain more than 70 warehouses in the principal industrial centers of the United States and Canada. This means that if you need reasonable quantities of stainless steel in a hurry, an Armco Distributor can probably deliver it to you within 24 hours.

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Electric Steel Foundry Co., Los Angeles
Electric Steel Foundry Co., San Francisco

COLORADO
C. A. Crosto, Inc., Denver
Metal Goods Corp., Denver

CONNECTICUT
The American Steel & Alloys Corp., Hartford
Herrick Company, Hartford
Edgcomb Steel of N. E., Inc., Milford

FLORIDA
Horne-Wilson, Inc., Jacksonville
Horne-Wilson, Inc., Miami
Horne-Wilson, Inc., Orlando
Horne-Wilson, Inc., Tampa

GEORGIA
Horne-Wilson, Inc., Atlanta
J. M. Tull Metal & Supply Co., Atlanta

ILLINOIS
Central Steel & Wire Co., Chicago
Chicago Steel Service Co., Chicago

INDIANA
W. J. Holliday & Co., Hammond
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KENTUCKY
Conner Mfg. Co., Louisville

LOUISIANA
Metal Goods Corporation, New Orleans
The Orleans Steel Products Co., Inc., New Orleans

MAINE
Herrick Company, Auburn
Brown-Wales Company, Lewiston

MARYLAND
Seaboard Steel & Iron Corp., Baltimore

MASSACHUSETTS
Brown-Wales Company, Cambridge
Industrial Steels, Inc., Cambridge
Congdon & Carpenter Co., Fall River
Herrick Company, South Boston
Warren F. Hoyo, Inc., Springfield

MICHIGAN
Central Steel & Wire Co., Detroit
Semmler Wholesale Supply Co., Detroit
The Behler-Young Co., Grand Rapids

MISSOURI
Richards & Conover Hardware Co., Kansas City
Metal Goods Corp., North Kansas City
Metal Goods Corporation, St. Louis
E. E. Souther Iron Co., St. Louis

NEBRASKA
Gate City Steel Works, Inc., Omaha

NEW JERSEY
Edgcomb Steel Corp., Hillside
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NEW YORK
Bruce-Mueller-Huntley, Inc., Buffalo
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Bruce-Mueller-Huntley, Inc., Rochester
Follansbee Metal Warehouses, Rochester
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NORTH CAROLINA
Edgcomb Steel Company, Charlotte
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OHIO
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OREGON
Electric Steel Foundry Co., Portland

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York Corrugating Company, York

RHODE ISLAND
Congdon & Carpenter Co., Providence

TENNESSEE
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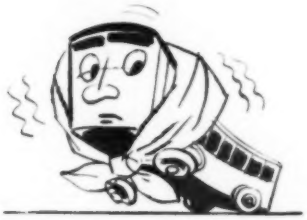
TALKING SHOP



90 Below

PERFECTION STOVE COMPANY, Cleveland, has just completed a $250,000 sub-zero lab capable of housing a couple of Greyhound buses at a time and producing a —90F temperature. It will be used to test cold-starting characteristics of internal-combustion engines (for which the company makes heating devices), characteristics of fuels and lubricants, metallurgy, and its own products. The lab proper is 30 2/3 x 32 1/4 ft, with a 10 x 30 2/3-ft ante-chamber. Three Brunner compressors in a 2-stage system do the cooling, with F-22 as the refrigerant. A Pittsburgh Lectrodryer supplies air at —10° dewpoint. Some work will also be done for outside companies.

Tool Engineer

TOLEDO UNIVERSITY will add a 4-year course in tool engineering, beginning this Fall, with a curriculum developed in cooperation with the ASTE. A certificate of Associate in Industrial Science will be granted to those completing the course, and 43 of the 56 credit hours in the curriculum can be applied toward a degree in engineering. The entire course can be completed in four years of evening sessions. Several other colleges are planning similar curricula to train junior production men.

Minus One Zero

ONE PRECISION-EQUIPMENT MAKER we've heard about has an engineering department which for years has bragged that it sets tooling tolerances to a ten-thousandth. That's true—every tool *drawing* shows practically all dimensions with such tolerances. But almost as soon as the new tolerances were applied, the shop discovered that they were unreasonable. They couldn't be held. What's more, the parts made by the tooling didn't require that accuracy. So the shop began to disregard one zero—and has consistently done so ever since. The engineers are happy; they have the tightest tolerances anybody has heard about for their class of work. And the shop is happy, too; tolerances of a thousandth aren't so tough. The only problem is the habit fixation that might make a shopman, some day, misread a vital number in the hearing of an engineer—or on an income-tax blank.

Psychological Accuracy

ACCURACY is sometimes only psychological. We have in mind the man who buys a jig borer with elaborate optical equipment, then places it on a concrete floor in the open shop where the sun hits it part of the time. Or, again, the man who wrings gage blocks together with dust motes on a corner or two. The block total is correct—but the measurement isn't. Or the man who makes a taper to a master accurate to five decimal points—with no measuring equipment in the shop capable of measuring an internal angle closer than to two or three. Or . . . but why go on? Each of these men thinks he's being accurate, so he's happy. But the measurements aren't.

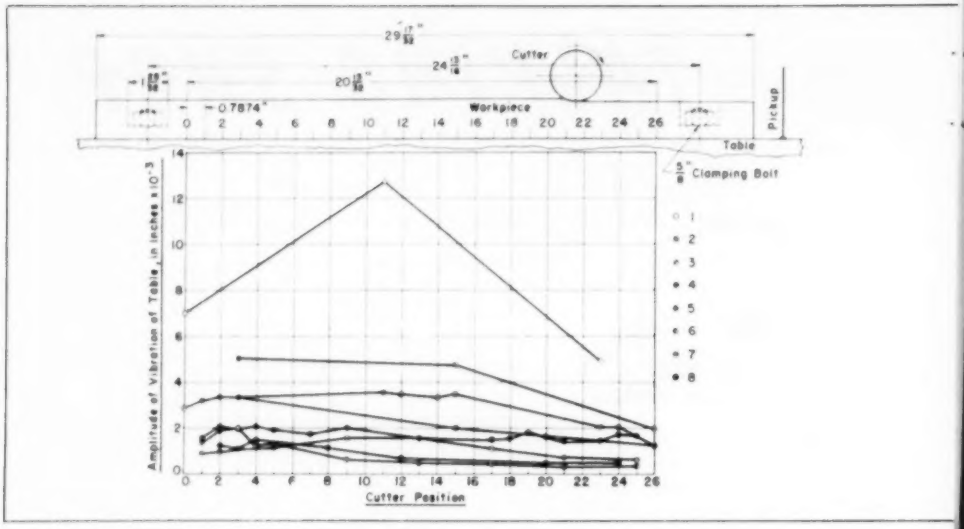
Same comments apply to the man who talks of radial accuracies in thousandths. At what radius? One second of arc is subtended by a thousandth of an inch at a radius of 206.4 in. What then of the arc-measuring tool that has a joint on which the tolerance is half a thousandth? Might as well forget the "second" graduations—if they're on it.

Hard is Hard

C U SCOTT of Rockford, Ill., who invented the steel-treating process called "Scottsonizing," reports that he is now processing 18-8 stainless. He's hardened milling cutters, reamers, spotfacers, pilots, and similar parts of 18-8 successfully, and the parts are neither ground nor lapped afterward—in fact they can't be, which is one problem. The piece is made to dimensions, and finished, then hardened, and that's that—if somebody changes his mind he's out of luck. Mr. Scott doesn't know why the tools were made of stainless in the first place (customers won't say) but is tickled that his process holds dimensions within a quarter of a ten-thousandth. He's also treated some splined shafts of 18-8, one $\frac{7}{8}$ in. in dia and splined its full length of 117 in., the other 3 in. in dia and splined for most of its 12-ft. length. They required no straightening.

More on Gear Noise

R P GARRISON, president of Garrison Machine Works, Inc, Dayton, Ohio, was reminded by our story of the noisy-geared machine tool (*AM*—Aug 4 '52 p 143) of this one. The master mechanic of a tractor plant, many years ago, claimed that quiet gears were not preferred on tractors in the early days. When a farmer invested a lot of money in a tractor, he wanted people to hear him as he drove down the road past his neighbor's houses. Mr. Garrison thought the story incredible at the time, but believes that our earlier story, and this one, shed new light on the whole matter of what appeals to the buying market at a given time.



WHAT'S WHAT IN MILLER VIBRATION

Tests on knee-type horizontal millers in Denmark indicate that movement between machine elements and increase in speed may damp vibration. A new report on an important subject about which little is known

Greatest damping effect on machine-tool vibration is friction between elements, according to studies just reported by Ivar Bendixen, ME, of The Machine Tool Laboratory of the Technical University in Copenhagen, Denmark. Mr. Bendixen described his experiments at one ASME session, Sept 8, during the Centennial of Engineering in Chicago.

Machine tools used in current tests at Copenhagen were a Wanderer universal (old and worn), and a Biernatzki plain, horizontal millers. The work is particularly important because of increasing stress on surface finish, maintenance of tolerances, and tool life. Very little has been reported on vibration. Some 800 test runs were made in the current series, with three different cutters and a variety of machine elements clamped. The steel workpiece, 2½ x 2½ x 29½ in., was 0.3 C, 0.32 Si, 0.66 Mn, 0.03 P, and 0.39 S, at 150 Bhn.

These were general results of tests:

With a 3 x 3-in. cutter having 14 teeth, vibration amplitude increased 20 to 24% when the overarm brace was removed, but 60 to 65% when the knee was unclamped from the column.

With a 3½-in.-dia cutter 1.4 in. wide, again with 14 teeth, vibration amplitude was increased 100 to 135% when the knee was unclamped, only 10 to 20% when the saddle was unclamped from the knee.

With a 3 x 3-in. cutter of 6 teeth, amplitude was increased only 10 to 15% when the overarm was unclamped from the column, but *decreased* 4 to 5% when the knee was unclamped, and *decreased* 2 to 3% when the saddle was unclamped from the knee.

Thus the most "hingy" machine can give the greatest amplitudes in some cases, the least in others. Paradoxically, a statically less-rigid column can be better than a more rigid one with regard to vibrations.

With the 3 x 3-in., 6-tooth cutter running at 72 rpm, heaviest vibrations were when the cutter passed over the bolts clamping the workpiece—in fact the machine elements had to be unclamped to keep from breaking the cutter. This also minimized the vibrations.

Resonance was also tested, and vibration in resonance occurred at three frequencies between 0 and 3000 cycles per minute, equal to the natural ones of the machine. Frequencies lowered slightly and amplitudes markedly when the knee was unclamped. Changing saddle position made some resonance frequencies more marked, made others almost disappear. Table movement lengthwise affected amplitude only, while lowering the knee displaced the resonance sections upward. Position of resonance sections was unaffected by running the machine idle, or even by simultaneous table feeding.

The fundamental forced frequency is the product of number of cutter teeth multiplied by its rpm. If a natural frequency is a multiple of this forced frequency, resonance will occur. Damping affects vibration amplitude only in the case of resonance.

At speeds below the critical ("static range"), vibration amplitude is determined mainly by the rigidity of the system—the stiffer the machine, the less the amplitude of vibration. But around the critical speed ("damping range"), amplitude is determined mainly by damping sources within the machine, and above it ("inertia range") amplitude is determined by the masses of the table and other elements.

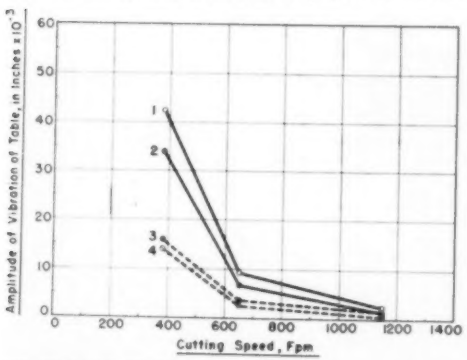
AMPLITUDE OF TABLE VIBRATION varies with cutter position. Curves 1 to 4 were made with 0.004-in. feed per tooth and 0.080-in. depth of cut. Curves 5 to 7 with 0.002-in. and 0.050-in., Curve 8 with 0.002-ipt feed and 0.040-in. cut. Other data:

Curve	Cutter	Setup	Column face to: table center, in.	inside overarm, in.
1	3 x 3, 6t	clamped	15.6	19.3
2	3 x 3, 6t	knee unclamped	15.6	19.3
3	3 x 3, 6t	clamped	5.5	9.25
4	3 x 3, 6t	knee unclamped	5.5	9.25
5	3 x 3, 14t	knee unclamped	10.25	21.8
6	3 x 3, 14t	clamped, overarm brace	16.15	21.8
7	3 x 3, 14t	knee unclamped	16.15	21.8
8	3½x1¼, 14t	saddle unclamped	5.7	——

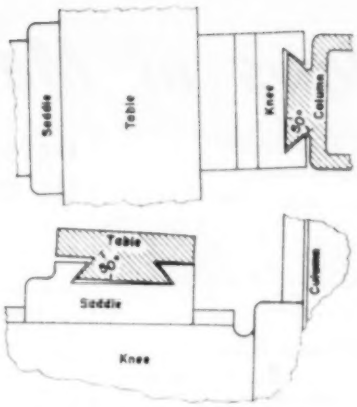
Damping results from friction between sliding surfaces, and from small relative motions between elements clamped together. Thus on the old Wanderer machine, damping was least at the center of the table where table guides were most worn and friction least in consequence. Over the bolts, vibration was greatest because relative motion between table and workpiece disappeared there.

Obviously, increasing the space between column and table—which moves the cutter out on the arbor—increases amplitude. Greatest amplitude occurs with the cutter in the middle of the arbor, even though the work is directly over the knee-elevating screw.

These tests can be summarized thus: The knee system in an ordinary knee-type milling machine has a certain number of natural frequencies in the range 0 to 3000 cycles per minute which might give resonance. This resonance will not necessarily produce serious



AMPLITUDE OF VIBRATION of the table decreases as cutting speed goes up. These tests were made with a single-tooth flycutter 5½ in. in dia and 0.59 in. wide on a 1¼-in.-dia arbor, with 0.005-in. feed per tooth. The overarm was unclamped from the column; all other elements clamped. Solid lines are up-milling, dotted ones down-milling. For Curves 1 & 3, cut was 0.040 in., true rake angle +3°; for Curve 2, cut 0.060 in. and true rake −5°; for Curve 4, depth of cut 0.060 in. and true rake −2°



PLAY BETWEEN VARIOUS MACHINE ELEMENTS here is exaggerated to show typical relative positions induced and sustained by torsional moments from cutting forces. Forces are concentrated at prismatic edges. Deflection is very large and reasonably independent of prism length. Thus, at joints there are a number of weak "springs"

vibrations while milling the workpiece in the region between the clamping bolts, but when the cutter is passing directly over the clamping bolts, greater amplitudes of vibration will occur. A substantial part of the damping is caused by the friction in the guides of the table. When cutting occurs outside the regions of resonant frequencies, the amplitudes will be smaller the more securely the various elements are connected or clamped to each other. While the knee was secured to the column by means of three clamping levers pressing against a gib, the saddle was held by only one. Tests indicated that the single saddle clamping lever did not permit effective clamping. At resonant frequencies, when all elements are clamped, the knee may become loosened from the column and resonance may disappear because of a shifting of the resonant frequencies to different values.

The most effective way of shifting out of a resonance section is to change the rpm of the cutter, or to use a cutter with a different number of teeth. A change in the feed, depth of cut, or width of cut may result in a shift out of a resonance section, because a small change in the rpm may be caused by slippage in the belt drive.

Mr Bendixen's conclusions are:

1. In the three frequency ranges, the smallest amplitudes occur with the:
   (a) greatest static rigidity in the static range;
   (b) greatest damping in the damping range; and
   (c) greatest mass in the inertia range.

The static range is of special importance with regard to machine-tool elements.

2. Rigidity of the setup under operating conditions and the direction of the cutting forces which tend to "upset" or relocate the various machine elements to relative positions, as shown in one sketch, are of basic importance with regard to good milling-machine performance.

3. Friction between the milling-machine elements has the greatest damping effect.

4. Amplitude of vibration decreases rapidly with increasing cutting speed and, at higher speeds, appeared to be unaffected by rake angle, depth of cut, and either up- or down-milling.

News of Metalworking

100th ASTE Chapter Formed in Athol

ATHOL, Mass—ASTE will have 100 chapters by October this year when the North Central Massachusetts Chapter is chartered. Total enrollment of ASTE is now over 22,390.

Timken Strike Ended

CANTON, O—United Steelworkers at three plants accepted terms comparable with those that ended the steel strike to close 30 days of no work at Timken Roller Bearing Co. Final wage raise was 10%, which averaged about $.16½ per hr. Disagreement over determination of shop seniority was compromised.

Slag May Be Source Of Needed Manganese

NEW YORK—American Iron & Steel Institute reports experimental work during the last two years may make reclaiming manganese from open-hearth slag practical. Three methods of recovering the material are at least technically possible now. US consumption runs around 694,000 tons a year, practically all imported. Estimated loss of manganese in slag is 772,000 tons a year.

Defense 'Corporations' May Put US Operations into the Black

WASHINGTON—The biggest business in the world, the Defense Department, is trying to put real business into its operations. It's doing this by putting military activity, such as a shipyard or arsenal, on a corporate basis. The idea includes operating funds, billings, and all the rest of standard business procedures. The aim is to make the officer in charge of the operation a sort of corporate boss who will have to face the prospect of going broke unless he runs his operation efficiently and tightly.

Chief architect of the plan, which is called the 'Industrial Fund', is Assistant Secretary of Defense Wilfred J McNeil. He's the top Pentagon money boss, and figures there's no reason the government can't perform manufacturing and operating as efficiently as private industry, providing someone is held accountable for profit and loss.

Pilot Operation

First tryout was the Pentagon's print shop, which was streamlined so it produced more with fewer employees. As a result of this success, the industrial fund is working at the Picatinny Arsenal, Rocky Mountain Chemical Arsenal, Philadelphia Navy Yard, Military Sea Transportation Service, and Tinker Air Force Base repair facilities.

Out of its fund, a government base pays salaries and expenses for materials and operating like any private corporation—with the exception of military pay and allowances. In return, it 'sells' its products or services to the Army with a regular schedule of billings and at prices established over a six-month trial period. Operating capital becomes a rotating fund. Payment is made on delivery.

No Profits

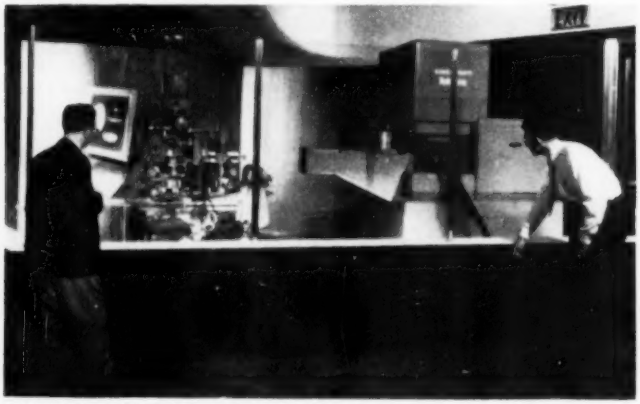
These corporations don't make profits, but are not intended to. The real reason behind the plan is to cut excessive spending and to put activities on a pay-as-you-go basis. A by-product advantage is that all this makes figuring out military appropriations easier, and simplifies explaining them to Congress.

Under the old plan, a Navy yard would have appropriations scattered all over the books, with the Bureau of Ships, the Bureau of Yards and Docks, and even the Bureau of Aeronautics all transferring funds to the yard to take care of their equipment and materials.

But now, the yard pays for all its own housekeeping, repairs, and operations, but charges each bureau for work done.

There are a couple of old-time similar arrangements — the Panama Canal Company and Maritime's National Shipping Authority—but application of the principle on a large scale is new. Defense planners are looking hopefully toward broader use of the plan in the military services.

So far, none of the activities have enough experience behind them to be able to produce evidence of dollar savings, but efficiency has visibly jumped at each application. Congress first frowned on the idea, thinking it took military activities away from Congressional control by removing them from direct appropriations, but defense planners pointed out that such control still exists. Congress votes appropriations to the military, and these are used to pay for the services rendered by the industrial-fund activities anyway.



THE OLD FREE-SAMPLE DEAL IS OUT. Cincinnati exhibit at Centennial of Engineering (Chicago) includes an 8x18 die miller that cuts ash-tray die with Centennial emblem. Hydroform press equipped with die operates only when visitor inserts dime in mechanism at right. Press loads, forms ash tray, and delivers it to visitor automatically. Bargain at that

British Productivity Team Reports Results in Engine Industry

LONDON — The Anglo-American Council on Productivity, issuing a followup report on results of its recommendations, notes considerable change in British engine production since 1950. The Internal-Combustion-Engine Productivity Team visited this country in '49, then returned to England with suggestions for streamlining production there.

Although it is difficult to separate the results of its work from the general reorganization and expansion of engine producers (diesel and gasoline, but not automotive), ICEPT reports:

- British Polar Engines, Ltd, doubled production in five years with little increase in labor force; also cut some machining time by as much as 70% because of new tooling.
- Crossley Brothers, Ltd, tripled output since '49 with only a small increase in personnel by overhauling its methods and with a new plant.
- Davey, Paxman & Co, Ltd, quadrupled connecting-rod and end-bearing capacity by establishing "specialist" departments and tooling a group of full-time machines for the jobs. New tooling upped bearing output 42% when forgings were finished on screw machines, replacing bar stock in turret lathes. Toggle clamps on a special fixture cut water-test time on cylinder heads by 48%.
- Petters, Ltd, made 300 cylinders a week in '38, 800 in '48, 2000 now—manpower has not increased at anything like this rate. Hours per engine in '49 were 37, in '51 were 31.2.
- Ruston & Hornsby, Ltd, doubled diesel-engine output over '47. Labor increase is small. New assembly layouts reduced handling.

Simplification

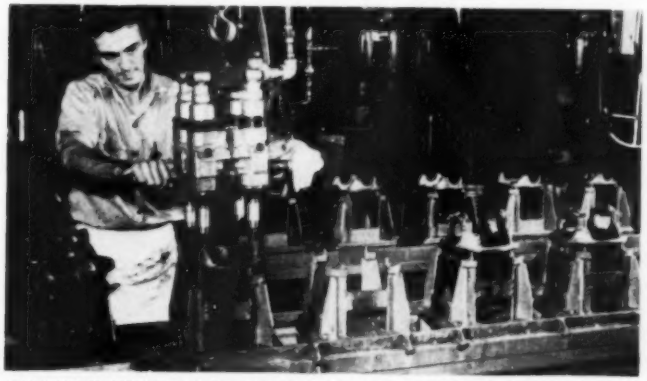
Range-of-product simplicity in the US impressed the team. Their comments to British industry on this score have borne results:

- R A Lister & Co, Ltd, cut engine types from 12 to three.
- Davey, Paxman, decided to reduce its 22 different engine models to four.
- National Gas & Oil Engine Co, Ltd, made 30 models; is now concentrating on 14.
- Ruston & Hornsby has extended batch production of larger engines by making basic engine blocks, then adding different equipment and accessories for various ultimate-use purposes.
- Blackstone & Co, Ltd, makes one vertical, six horizontal engines instead of over 22 types. Production has doubled.
- Petters makes two diesel, two gasoline engines where it used to make a wide range of sizes and types. Typically British, the report says "This company has probably simplified its range of engines as much as is possible."

New Ideas

British engine makers, spurred by the team report on US methods, are picking up on a large scale many ideas that few of them thought practical for their own purposes five years ago. Planned machine replacement, more specialized equipment, specialization in plants and departments, continuous assembly and dovetailing production lines, assembly flow and roller conveyors; all are now popular in the industry that makes diesel and gasoline engines.

Other ideas being tried out are overhead conveyors, air chucks and air clamps, production-control processes, incentives, and accented apprentice systems and upgrading. All this sounds like a rehash of present US practice, which is just what it is. British industries are realizing that high-production ideas can be profitably applied to small and medium size shops that handle their work mainly in batches.



MULTIPLE NUT RUNNERS REDUCE HAND ASSEMBLY TIME. Assembly line for differential carriers at Ford's Mound Road plant has power runners that tighten four or five nuts at a time, increasing speed over single tools by more than 200%. Identical air motors in the tool make assembly fully uniform, too

HOUSTON METALWORKING BOOMS

HOUSTON—A 73.6% increase in metalworkers here since '47 puts Houston a close second to Birmingham, leading metalworking city in the South. Current employment in metal trades for Houston is over 39,000. This gain, as well as large gains in Ft Worth, Dallas, and Atlanta, is largely attributed to defense contracts growing out of the Korean War.

Drawing Wax May Open New Lubricant Field

RACINE, Wis—S C Johnson & Son, Inc, has asked the University of Michigan for basic research on wax lubricants after accidently hitting good results in drawing operations. Minneapolis-Moline Co, Hopkins, Minn, cut scrap losses to a fifth when drawing tractor-valve covers with wax lubricant. Wax lubricants for grinding operations have worked, and wax coolants for cutting tools have increased tool life 150 holes per drill.

OLYMPIA SHOWS WILL DEMONSTRATE LATEST EUROPEAN AND US EQUIPMENT

LONDON—The International Machine Tool Exhibition at Olympia, London, will show over 2000 new pieces of equipment from Sept 17 to Oct 4. Exhibitors will attend from Belgium, France, Germany, Italy, Scandinavia, Switzerland, Britain, and US.

One trend in the machines noted already from announcements is one toward increased spindle speeds based on use of carbides. Some internal grinders with speeds to 100,000 rpm will be shown.

A new honing machine by Delapena & Sons (English) is in the prototype stage and may be ready for the show. A Flextrol, Ltd, grinding and cutting (disk) machine operates at 7500 rpm. Wickman, Ltd, will demonstrate a new eight-spindle bar machine for 1¾-in. stock which has an auto-setting mechanism.

Other equipment scheduled for the show includes a David Brown hobbing machine that will cut spline shafts up to 35 in. long and spur and helical gears to a 15-in. dia, an Achol Senior rotary miller for face and side cutting that will handle two parts at once, a Smart & Brown 9-in. lathe in three models, and a James McNeill adjustable magnetic chuck (believed to be the first made) that can be extended to any length in units of 18 in.

Burnham Finney, Editor, is visiting the Olympia Exhibition and the Hanover Fair, and will make reports on tools, equipment, and ideas seen there in future issues of American Machinist.

Mobilizers Look for CMP Replacement

WASHINGTON — Controlled Materials Plan, already on its last leg, will be dropped completely next spring by Washington controllers. The CMP job of reporting what business does with raw materials will be picked up by somebody—as yet not chosen.

Under CMP, every substantial user of metal has to apply four times a year for allotments of controlled materials. His application form must show in detail what metals he must use, and for what purposes. This gives controllers information they need to administer CMP, which is basically a chanelling system that routes scarce materials into defense production at the expense of other users.

The system also has byproduct advantages, such as telling the armed forces if a new weapon will require new capacity to produce it.

Keeping up this flow of information is the concern of the Munitions Board, DPA, and the Office of Defense Mobilization. (At this writing, Henry H Fowler had just resigned his NPA job and agreed to handle DPA and ODM until the end of the year.)

New System

Requirements for a new way of finding out this information are:

- Economy in time and money to government and industry. This is why nobody now wants to have manufacturers continue filing reports.
- More detail than any peacetime report, other than present CMP forms. All this detail is not necessary unless we hit a full war, so the government will continue keeping most of the dope under cover.

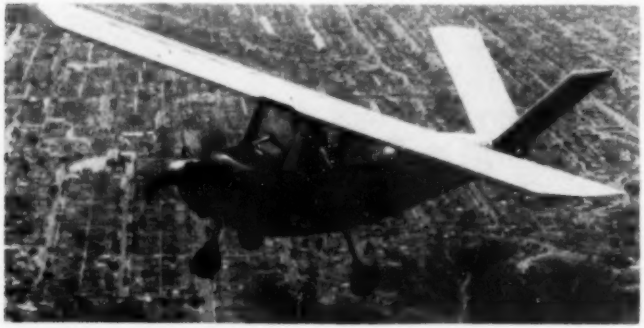
One possibility almost fits these specifications. The Census of Manufacturers might be able to do the job for '53, although their books are just about closed and changes in forms to be sent out would be difficult.

Here's what's wanted:

Detailed information on materials consumption for specific products is necessary. The '47 census touched on 2500 individual metal products, but specific data on production was lumped in 400 to 500 broad classifications. For example, parts for laundry equipment were grouped in a category that included both home and commercial units, which would not fill the bill in this case. Commercial equipment would be more important in time of war, while home units could be skimped if necessary.

Military officials also want to know how much raw steel and steel-fabricating facilities they can lay their hands on without crippling critical civilian production.

Mobilizers also want more data on what shapes and sizes of formed materials are used. The '47 census reported only on a few basic forms, so this part of the census would have to be changed. Mobilizers will settle for something less than the detail of CMP, but they want to get as close to it as reasonably possible.



HONEY BEE WEIGHS ONLY 550 LB, HAS 65-HP ENGINE, boasts cruising speed of 100 mph. The all-metal single-placer has a butterfly tail for manufacturing economy, and features spring-steel landing gear. Wing flaps, full-span slots, and trim controls may be optional features

CENTENNIAL OF ENGINEERING JOINS 60 SOCIETIES

CHICAGO—The largest meeting of engineers ever staged ran from September 3 to 13, with the educational exhibit centered at the Museum of Science and Industry, and with technical sessions spread all around Chicago. Total engineering-society memberships of 33,000 were represented by 290 technical sessions at which over a thousand papers were presented.

The centennial marks the 100th anniversary of the founding of the American Society of Civil Engineers, first US professional group. The September 29 issue of *AM* will highlight the centennial.

West Coast Survey Shows Machine Lack

EL SEGUNDO, Calif—Machine-tool and equipment needs of western industry are as bad or worse than the rest of the country, according to results of a survey by Trumpis-Collar & Associates, made for Hufford Machine Works, Inc. One fact brought to light is that some aircraft companies are placing sizeable subcontracts with midwestern and eastern firms mainly because equipment seems to be more available in those areas.

A questionnaire covering equipment used, recently purchased, and needed, availability of spare parts, expansion plans, and future needs was sent to 84 chambers of commerce in 13 western states. Among other findings, it was noted that the companies contacted thought spare-parts supplies of manufacturers and dealers were inadequate.

Delays on delivery of milling machines, screw machines, turret lathes, punch presses, swagers, routers, and many others were reported over a year, and in some cases nearly two years.

Home Repairs

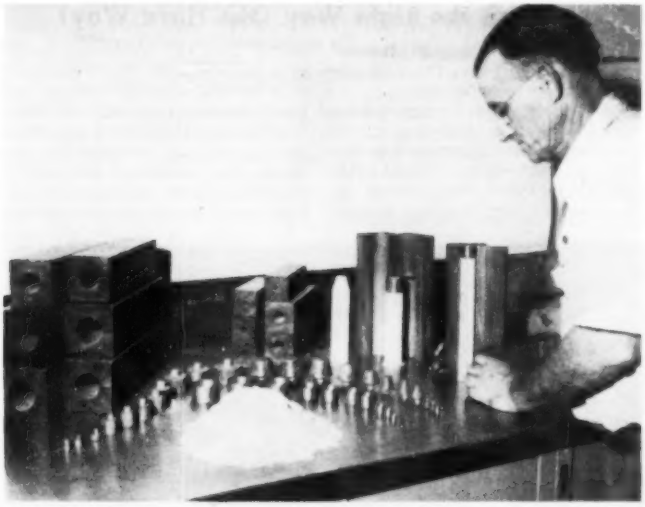
Because of delayed deliveries, it is common practice for manufacturers to use their equipment to the breaking point, then attempt repairs in their own shops. Nearly 65% of the shops contacted were able to make most of their own repairs, 23% made some repairs, and the balance either had new equipment or had good factory service.

Plans for expansion have been halted by the machine situation in 20% of the plants, and more than 35% reported difficulty in getting equipment. Many firms have given up purchasing ideas for the present.

Expansion Plans

Future equipment needs for 51% of the plants were reported about the same as now—indicating that present equipment is about right. About 11% indicated plans for expansion in a different field but half of these could do with present equipment. According to James L Hess, consultant for Trumpis-Collar, long-distance delivery is a problem, and "the need for a West-Coast machine-tool industry has been clearly established. . . ."

Despite machine-buying troubles, some 62% of the companies contacted still plan future expansion, hoping machine tools will ease up.



STANDARDIZED CYLINDRICAL CORE BOXES SIMPLIFY FOUNDRY JOBS. National Bureau of Standards experimental foundry uses 14 boxes in sizes from ¾ to 2 in. in ¼-in. steps. Brass inserts are added to wooden boxes to form tapered ends (all at 15°). Sand is conventional mixtures. Core prints behind brass inserts will form holes in molds to receive cores

Metalworking Abroad

(By McGraw-Hill World News)

Key Dutch Steel Men Train Here—in operation of slabbing and strip mills, equipment for which was purchased here. Royal Netherlands Blast Furnace & Steel Co superintendents and engineers will tour US Steel, Youngstown, and Bethlehem plants for three months.

Brazilian Auto Industry is More Certain—because of a concrete proposal approved by the Industrial Development Commission there. The industry will produce jeeps, tractors, trucks, and automobiles using local industry to produce parts and accessories. Aim is to reduce drain on foreign exchange without damaging national expansion program.

Japan Gets Priority Equipment—to build up the local steel industry. Up to $20 million worth of machinery has been approved by NPA for export to Japan. Plans for machinery buying this year total $30 million in dollar volume, including some equipment from West Germany.

Mexico Buys Six British Jets—from DeHavilland Aircraft. Cost for four single-seat fighter planes and two trainers will be $700,000. They will be the first jets for Mexico, and will fly out of new jet-plane field at Santa Lucia, north of Mexico City.

Israel Seeks Plants—to make pig iron, steel castings, copper strip and bar, aluminum castings, lead extrusions, tools and dies, machine tools, and gears. Firms are wanted to locate in Israel to build up the national economy, and would be allowed special exchange rates, some tax exemptions, duty-free import of machinery, and other privileges.

French Foundries to Get US Aid—to increase productivity. Based on results in nine test foundries that US experts revamped, 100 more will be aided through Mutual Security Agency. French government and industry have pledged over 300 million francs to back up the expansion program.

SKF Contracts Brazilian Producer—to turn out transformers to its specifications to be sold under SKF name in South America. Sao Paulo company will expand its plant as much as possible (big limiting production factor in Brazil is power).

Aircraft Rescheduling Cuts Back Production 10%

WASHINGTON—Aircraft schedules are like the will o' the wisp. No matter how many times they are revised, they just can't be met. They've changed at least 18 times since the Korean trouble started, and there's every indication that more changes are in store.

Right now the goal is to turn out 1250 per month by September '53, which is a far cry from the original program of 2000, supposed to be attained during this year.

Nobody can explain the situation very well. The old reasons—machine tools, metals, skilled help—are used over and over again. Shortages are called slippages, slippages are called revisions, and revisions are called realistic scheduling.

Actually there are four main reasons:

1 The machine-tool problem wasn't recognized by the government until a year after Korea started, and the goals set in '50 were impossible to meet.

2 Politics got into the picture when the President slapped a lid on defense spending last year, causing a cutback and the stretchout.

3 Disagreements on plane types in both government and civilian management loused up the issue, too. Pentagon wanted too many fancy gadgets, and there were too many design changes during actual production.

4 Technology troubles have been important. Developments in jet engines have been a little behind necessity all along. Engines with 5000 lb thrust were originally planned, but proven designs for engines with 10,000 lb were available at about the same time. Only recently has the Pentagon decided to cut 7500-lb engines. In some cases, the Air Force still clings to the inefficient J-65 Sapphire while there are better powerplants in production.

Latest Revision

A-18, the current program, waters down previous goals by about 10%. The big reason for this change is costs—particularly in airplanes. And the main reason for costs is inflation.

There are other reasons, too, demonstrated by the Wright J-65. It's taken about two years to get the tooling ready. Even so, production goals were overoptimistic—the engine doesn't seem to lend itself to mass-production processes very well.

Wright's schedule has been reset by Washington to peak gradually in middle '54 at 900 engines a quarter, instead of at 1700 in early '53. The old piston R-1300 is included in this total. Production of the J-65 is supposed to end in '55, but it will probably be dropped in favor of the Olympus that Curtiss-Wright is licensed to build.

Buick got a bigger share of the J-65 contract, and will be making 900 a quarter by early '54.

The Score

Here's how the new schedule stacks up against the old:

A-16, of last January, called for 71.2 million airframe lbs to be delivered in the last half of this year, 170.5 million in '53, 209.3 million in '54, and 79.8 million in '55.

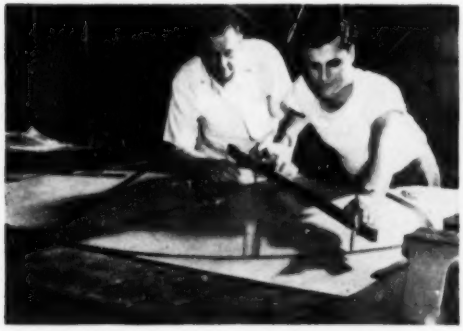
A-17, issued later, died fast and can be ignored. It called for higher deliveries this year and next, which were not possible.

A-18, the present schedule, quotes 71.2 million airframe lbs in the remainder of this year, 167.6 million in '53, 201.9 in '54, and 75.9 million lbs in '55.

Jet Metalsmiths (Apprentices) Learn the Right Way (the Hard Way)

E HARTFORD, Ct—Centered entirely on jet-engine construction, a training program instituted by Pratt & Whitney Aircraft is taking apprentices through a three-year, 6000-hour course in metallurgy, practical shop training, woodworking, plaster molding, and metalworking. Apprentices start at $1.15 an hour, and get a boost after each 1000 hours until they end up at $1.73 an hour. They get the other regular benefits, too.

The urgent need for apprentices, also felt in other sections of metalworking, is directly traceable in this case to the engine. Considerable sheet-metal work that cannot be done on machines, or cannot be completely done on machines, is necessary. There is some machining, along with welding, forging, riveting, and other common processes; but sheet forming has turned out to be one of the most critical processes. The situation has spotlighted the lack of skilled craftsmen, and has made apprentices necessary in large numbers.



FLAT-SHEET LAYOUT with trammel starts production of conical section for jet engine

PRECISION FIXTURE clamps and positions spherical section for drilling assembly holes

Harold E Churchill

Admiral A G Noble

Arthur M Stoner

W P Innes

Names in the News

Harold E Churchill has been appointed chief engineer of the Studebaker Corp, succeeding the late **Stanwood W Sparrow**, vice president in charge of engineering. Associated with the organization for 26 years, Mr Churchill has been director of research since 1948. **M P deBlumenthal** has been promoted from assistant to chief research engineer.

Admiral A G Noble, USN, (Retired), has been elected executive vice president, and member of the executive committee and board of directors of the Nordberg Mfg Co, Milwaukee. Since his retirement from the Navy, Admiral Noble has been serving as vice president and general manager of Martin-Parry Corp, Toledo.

Harvey F Phipard, Jr, has been appointed director of research and engineering, Hy-Pro Tool Co, New Bedford, Mass. **Edward J Locke, Jr**, has been named chief engineer, and **George E Jenney, Jr**, master mechanic.

James Whitney Sibley, Jr has been appointed deputy director of the Metalworking Equipment Div, National Production Authority. Mr Sibley is on loan from the Buick Div, General Motors Corp, where he serves as special representative of the general manager.

Harlie F Byrne has been appointed sales manager of Artisan Metal Works Co, Cleveland. Mr. Byrne has been serving as administrative engineer at Pesco Products Co for the past five years, and prior to that was design engineer with Lockheed Aircraft Corp, Burbank, Calif.

Arthur M Stoner, vice president in charge of engineering of Jacobs Mfg Co, West Hartford, has been awarded the Certificate of Merit by the Franklin Institute of the State of Pennsylvania. The award is being presented to Mr Stoner for his development of a chuck and collet combination for lathes to hold cylindrical work being machined.

Horace Douglass Moulton has been appointed assistant vice president, raw materials, US Steel Co, with headquarters in Pittsburgh. Mr Moulton joined the organization in 1939 and since 1946 has been serving as vice president, operations.

Malcolm Roberts has joined the Cleveland office of Kurt Orban Co, Inc, Machine Tool Div. Mr Roberts was previously associated with the New Britain Machine Co as Cleveland sales engineer.

W P Innes has been named technical director of MacDermid Inc, Waterbury, Conn. He has recently been associated with the Research Laboratories Div, Electrochemistry Dept, at General Motors Corp.

Robert F Nelson has been elected president and general manager of the Lanston Monotype Machine Co. Mr Nelson, former vice president of American Type Founders, Elizabeth, NJ, is chairman of the panel on Guns, Research and Development Board, Washington, D.C.

William C Ayres has been named manager of materials, Hotpoint Co. Mr Ayres was formerly administrative assistant of the materials dept; he succeeds **Albert H Behnke**, resigned.

Glen McDowell has been named sales manager of Lewis rolls, Blaw-Knox Co, succeeding **J M Lewis**, appointed assistant to the vice president in charge of all roll sales.

OBITUARIES

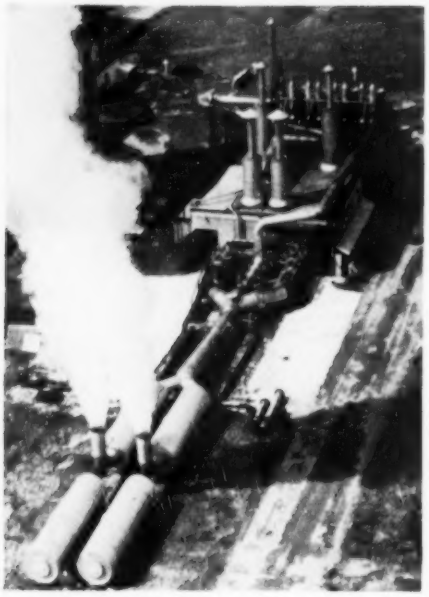
Stanwood W Sparrow, 64, vice president in charge of engineering for the Studebaker Corp, died at Southbridge, Mass., August 14. From 1918 to 1926 Mr Sparrow worked for the US Bureau of Standards, becoming chief of the automotive power section. He joined Studebaker in 1926 and was appointed a vice president in 1948.

Hugh J Fraser, 54, vice president in charge of all US plant operations of International Nickel Co, died in Montreal August 22. In addition to the post he held at the time of his death, Mr Fraser was an assistant vice president of the parent organization, the International Nickel Co of Canada, Ltd.

Wallace Tenney Montague, 63, vice president of Norton Co, Worcester, Mass., died July 30. Associated with the company for 40 years, Mr Montague was appointed vice president and manager, business planning and development in 1942. He was a director of the Grinding Wheel Institute at the time of his death, and former board chairman of both the Grinding Wheel Manufacturers Association and the Abrasive Grain Association.

E W Cleveland, vice president and special sales representative of the Cleveland Pneumatic Tool Co, and the nation's oldest active pilot, died August 7 in an airplane crash.

(Continued on page 256)



AIR VIEW OF UNITED AIRCRAFT CORP'S ramjet engine laboratory in which work is being carried on for Pratt & Whitney Aircraft. United is testing burner units for the high-speed power plants; Pratt & Whitney will develop and build full-scale ramjet engines. Laboratory, in operation since April 1950, is a joint project of United and the Navy.

General Tire Initiates Small Firm Production Pool

AKRON, Ohio—General Tire Co has set up a production pooling arrangement enabling small business firms to band together to share in defense contracts.

First of its kind, the program has the approval of the Attorney General, the Federal Trade Commission, and the Small Defense Plants Administration.

Production pooling is not new, of course; many such groups operated efficiently during the last war. Operating on the "mother hen" principle, however, the General Tire Production Pool, Inc, sponsors and finances the pool. As sponsor, it will solicit defense contracts, assume liability for fulfilment of orders, and provide sales, design and development engineering services, plus accounting and legal assistance.

General Tire will act as any large manufacturer subcontracting work to other firms; it will do none of the manufacturing—production facilities will be provided by small industries in surrounding areas. This is an opportunity, General feels, for smaller companies, unable to secure and negotiate contracts individually, to procure defense business collectively.

In addition to General Tire, pool members include McCaskey Register Co, Alliance, Ohio; Ectro, Inc, Delaware, Ohio; Sterling Mfg Co, Cleveland, Ohio; Electronic & Mfg Co, Akron.

To be eligible for membership, a business must have less than 500 employees and be equipped to do high precision manufacturing. As sponsor, General is exempt from the "small companies" limitation placed on membership by SDPA.

The corporation itself is a nonprofit, no-dividend organization. Activities of the pool will be confined to the defense program; members are free at all times, however, to solicit and accept other business for their own operation—either government prime contracts or orders from other sources. General will be permitted a fee for its management services.

$10 Million Generator Contract

LIMA, Ohio—Westinghouse Electric Corp's Small Motor Div has received a $10.5 million order for aircraft generators. The Air Force contract is the largest defense order received by the division to date.

Rhode Island Distributing New Production Facilities Directory

PROVIDENCE, RI—A directory of state defense production facilities has been prepared by the Rhode Island Development Council for distribution to Federal procurement agencies and prime contractors.

The directory includes an alphabetical listing of products and services, basic data on 1600 firms, and a listing of manufacturers who supplied information on their facilities.

Information on products and services supplies names of manufacturers who either now produce the product or service, produced the item during World War II, or are presently equipped to produce it, although it is not a part of their regular line.

Air Materiel Decentralization Program Adds 16 More Classes

DAYTON, Ohio—Decentralization of procurement activities is continuing at Air Materiel Command Headquarters, Wright-Patterson Air Force Base.

An additional 16 classes of AF supplies will be purchased at materiel areas and specialized depots throughout the country. Original decentralization program called for transfer of buying activities to nine bases; additional classes will bring four more bases into the schedule.

The program was inaugurated to provide for increased efficiency, greater economy and security, and room for future expansion. No transfer of personnel will be involved.

Midwest Firms Get $21 Million Air Force Contract Awards

CHICAGO—More than $21 million in prime Air Force contracts has recently been awarded to 25 manufacturers in the central west, according to the Midcentral Air Procurement District office.

Largest contract—more than $12 million—went to Minneapolis-Honeywell Regulator Co for component parts for automatic pilots and special tools.

Heil Co, of Milwaukee, received a $2.2 million order for cover assemblies, semi-trailers, and spare parts for fuel servicing trailers. A $2 million contract for aircraft camera systems and accessories was awarded to Chicago Aerial Survey Co.

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Chicago Ordnance District

Free Sewing Machine Co. Rockford, Ill.—lighter, fuze, $330,372.

Brad Foote Gear Works Inc, Chicago—final drive and support assy, $1,304,239.

Toastmaster Products Div, McGraw Electric Co, Elgin, Ill.—fuses, $716,317.

Diamond T Motor Car Co, Chicago—trucks, $828,194.

Wisconsin Motor Corp, Milwaukee, Wis.—auxiliary engines, $213,666.

Bell & Howell Co, Chicago — periscopes, $958,898.

International Harvester Co, Chicago—trucks, $22,150,122.

Speed-O-Print Corp, Chicago—fuzes, $1,069,146.

National Pressure Cooker Co, Eau Clair, Wis.—fuzes, $1,680,840.

Minneapolis Honeywell Regulator Co, Minneapolis, Minn.—periscopes, $1,981,197.

Detroit Ordnance District

Pontiac Motor Div, Pontiac, Mich.—cargo carriers, amphibious, $16,733,293.

Canadian Commercial Corp, Washington, DC—metal rotating bands, $1,215,000.

Continental Motors Corp, Muskegon, Mich.—engine assys, $2,696,939.

International Harvester Co, Detroit—engine assys, $476,320.

M-N Metal Products Co, Hazel Park, Mich.—enclosure kits for cargo trucks, $147,066.

Saginaw Industries Co, Saginaw, Mich.—fin assys, $241,960.

Bennett Equipment Co (Security Account Register Co) Oak Park, Mich.—kits for cargo trucks, $124,249.

International Harvester Co, Detroit—engines, $2,625,000.

Michigan Metal Products Co, Battle Creek, Mich.—fin assy, $179,205.

L A Young Spring & Wire Corp, Detroit—metallic belt links, $312,900.

Saginaw Industries, Saginaw, Mich.—fin assy, $121,540.

Kelsey-Hayes Wheel Co, Detroit—metal parts, shell, $3,040,000.

Detroit Brass & Malleable Works, Detroit—metal parts, booster, $2,036,400.

Grand Rapids Hardware Co, Grand Rapids, Mich.—metal parts, booster, $1,430,160.

Calumet & Hecla Consolidated Copper Co, Wolverine Tube Div, Detroit—metal parts, primer, $523,845.

Rock Island (Ill.) Arsenal

James Counningham Son & Co, Inc, Rochester, NY—cradle, pintle, and ammo box assys, $571,954.

Ideal Industries, Inc, Petersburg, Ill.—telescope cases, $100,040.

NAVY AWARDS

Bureau of Ships, Washington 25, DC

Worthington Corp, Washington, DC—air compressors, $186,908.

Lock City Machine & Marine Inc, Sault Ste Marie, Mich.—utility boats, $1,240,600.

Weldcraft Steel Co, Bellingham, Wash.—utility boats, $429,689.

Tacoma Boat Bldg Co, Tacoma, Wash.—patrol boats, $488,461.

Weaver Shipyards, Orange, Texas—patrol boats, $866,400.

Sound Ship Bldg Corp, College Point, NY—patrol boats, $875,000.

Higgins, Inc, New Orleans, La.—LCM's, $18,357,219.

Olson Shipyards, Inc, Chicago — LCM's, $525,500.

American Pipe & Construction Co, Portland, Ore.—LCM's, $5,508,097.

Quincy Adams Yacht Yard, Inc, Quincy, Mass.—motor whale boats, $571,716.

Palmer Scott & Co, New Bedford, Mass.—motor whale boats, $512,207.

Purchasing Office, Washington, DC

Clark Equipment Co, Buchanan, Mich.—fork lift trucks, $537,232; tractors, $169,917.

Federal Motor Truck Co, Detroit, Mich.—crane trucks, $2,669,782.

Baker-Raulang Co, Cleveland—crane trucks, $176,714.

ARMY SIGNAL CORPS

Philadelphia Supply Agency

Belmont Radio Corp, Chicago — receiver-transmitters, $1,541,215.

Parkchester Machine Corp, New York—mountings, $505,619.

Crosley Div, AVCO Mfg Corp, Cincinnati, Ohio—receiver-transmitters, $2,250,687.

Stewart-Warner Corp, Chicago — receiver-transmitters, $756,106.

Allen B DuMont Labs, Clifton, NJ—receiver-transmitters, $2,424,642.

Motorola, Inc, Chicago — radio receivers, $1,376,116.

Emerson Radio & Phono Corp, New York—radio sets, $631,566.

Trav-ler Radio Corp, Chicago—mountings, $1,447,862.

Automatic Mfg Corp, Newark, NJ—control units, $144,892.

Gray Mfg Co, Hartford, Conn.—control boxes, $307,080.

Caroled Co, Inc, New York—mounting equipment, $193,797.

Lionel Corp, Irvington, NJ—control boxes, $446,780.

Standard Piezo Co, Carlisle, Pa. — crystal units, $261,186.

Perfection TV Mfg Corp and E Kral & Co, Bronx, NY—maintenance kits, $184,307.

Sheroid Crystals Inc, Kansas City, Kans.—crystal units, $249,194.

MARINE CORPS

Quartermaster General, Washington 25, DC

Hotpoint, Inc, Chicago—cooking equipment, $230,859.

Stamsteel Corp, College Point, NY—shelving & pallets, $436,250.

Boyertown Auto Body Works, Inc, Boyertown, Pa.—mobile machine shop trailers, $649,447.

Homestead Valve Mfg Co, Coraopolis, Pa.—steam-cleaning trailers, $241,637.

AIR FORCE AWARDS

Air Materiel Command, Dayton, Ohio

Jack & Heintz, Inc, Cleveland—inverters, $201,718.

Eastman Kodak Co, Rochester, NY—hemisphere sights, $2,577,388; camera and tooling, $1,341,981.

Bendix Radio Div, Bendix Aviation Corp, Baltimore, Md.—radar sets.

Delco Radio GMC, Kokomo, Ind.—distribution panels, $1,229,134.

Fairchild Camera & Instrument Corp, Jamaica, LI, NY—camera systems, $1,555,130.

Landers, Frary & Clark, New Britain, Conn.—inverters, $580,290.

Goodyear Tire & Rubber Co, Akron, Ohio—wheel & brake assys, $1,487,632.

Kollsman Instrument Corp, Elmhurst, NY—speed indicators, $1,060,147.

Worthington Corp, Cincinnati, Ohio—compressors, $323,185.

De Villbiss Co, Toledo, Ohio—compressors, $259,069.

Chicago Aerial Survey Co, Chicago—bodies, lens cones, magazines, $2,075,300.

R E Uptegraff Mfg Co, Scottdale, Pa.—transformers, $311,345.

Munston Mfg, Islip, LI, NY—audio coders & decoders, $117,901.

Reeves Instrument Corp, New York—video mapping groups, $604,411.

Houston-Fearless Corp, Los Angeles, Calif.—aircraft cameras, $830,944.

Aircraft Radio Corp, Boonton, NJ—radio transmitters & receivers, $303,406.

Knox Metal Products Inc, Thompson, Ga.—collapsible wheel clocks, $206,250.

Courter Electric Products, Inc, Grand Rapids, Mich.—amplifiers, $165,041.

AiResearch Mfg Co, Div, Garrett Corp, Los Angeles—thermostat actuator assys, $539,789.

Eclipse-Pioneer Div, Bendix Aviation Corp, Teterboro, NJ—indicators, $5,905,014; regulators, $564,618.

Worthington Corp, Cincinnati, Ohio—air compressors, $1,763,901.

Philadelphia Supply Office

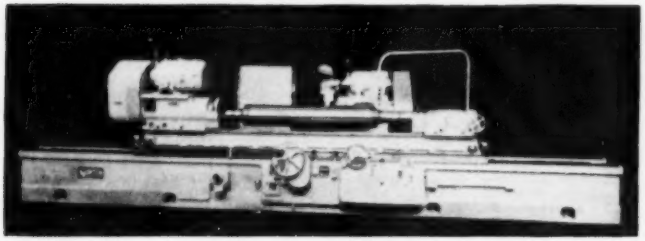
United Aircraft Corp, Pratt & Whitney Aircraft Div, East Hartford, Conn.—tube assys, $162,052; engine valves, $180,859.

Eclipse-Pioneer Div, Bendix Aviation Corp, Teterboro, NJ—oxygen regulators, $315,410.

Permoflux Corp, Chicago — headset assys, $213,488.

Tailcones for General Electric's J-47 jet engines are lined up for inspection in the company's Lockland, Ohio plant. These components were manufactured by subcontractors throughout the country under GE's "Lockland Plan." Thousands of parts for the J-47 funnel in from over 4000 suppliers in 41 states; 60¢ of every dollar received by GE from the Air Force for jet engines is passed along to subcontractors.

New Shop Equipment



Setup and Operation Eased on Norton Cylindrical Grinder

In addition to fast grinding action, the Norton Type C-2 cylindrical grinder offers features that reduce costs by simplifying setup and operation, and by requiring less maintenance. It is built as a plain or semiautomatic machine in 18, 24, or 30-in. swing, and in work lengths of 48, 72, 96, 120, 144, or 168 in. It is a heavy-duty rugged unit.

With this machine, setups are quickly made because all controls for feeds and speeds are adjusted at the front of the machine in the operating position. Actual operation of the Type C-2 is considerably simplified by several important features. One of these is the combination graduated wheel feed handwheel and "click-count" indexing mechanism which readily indicates the amount of feed as the wheel is rotated past a fixed pointer, and permits settings of 0.0001 in. in work diameter instantly and without visual attention.

Further operating ease is provided by the pre-set truing and grinding speed arrangement. With this feature, table speeds for truing and grinding are independently adjustable and pre-set, and either speed is immediately obtained when desired, by movement of a combination selector and table start-stop lever. No resetting of these speeds is necessary in the change from one to the other. Work-jogging control by means of an easily-handled lever conveniently located near the operating position is also provided.

Additional operating ease comes from automatic or manual control of work rotation and coolant flow, and automatic adjustable wheel feed at table reversals with automatic resetting of the wheel head. Separate dwell controls for each end of table reversal are also provided.

To simplify and speed maintenance functions, all pumps and motors are placed in accessible locations outside of the machine. Filters, relief valves, ways-lubricant flow-control valves, and all oil reservoirs are also on the outside. Electrical controls are grouped in an elevated enclosure for protection and for maximum convenience in inspection. Other advantages are a large capacity low-wall coolant tank that has a ramped outlet for easy clean-out, and a hinged wheel guard cover for easy wheel change. The base ways are protected by space-saving, steel-tape guards.

The wheel spindle unit houses pressure-lubricated bearings which enclose over 50% of the wheel spindle body to provide exceptional rigidity. With its minute oil clearance requirements, this unit is equally efficient for the finest finishing operations or for heavy stock removal jobs without any bearing or oil-pressure adjustment.

The Type C-2 semiautomatic machine provides all of the foregoing advantages and in addition, its grinding cycle operates with "one-lever" control. When operating on the electrically-timed cycle, the operator need only load the machine, touch a control lever, and the machine will go through its cycle automatically. All other features are the same.

Norton Co, Worcester 6, Mass.

Table stroke	6	in.
Saddle stroke	4½	in.
Length of Table	26	in.
Width of Table	7	in.
Height from floor to spindle center	40	in.

Hill Automatic Face Grinder

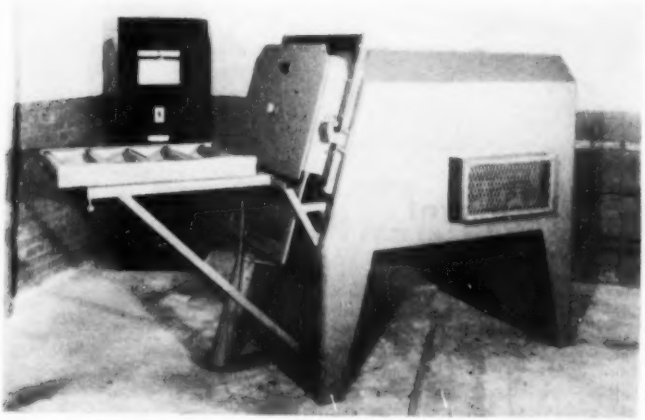
Automatic face grinder or lapping machine has a variable-speed, hydraulically-operated table which assures an accurate work motion, as the piece passes the grinding head. A hydraulic infeed provides constant pressure against the wheel.

The operator only has to load the work-holding fixture and press one button—the machine then automatically does the following: (1) starts timing the cycle; (2) moves the work from the loading position to the working position; (3) reciprocates the work across the face of the wheel and feeds it toward a fixed stop; (4) provides an adjustable spark-out period; (5) retracts the work from the wheel and returns the table to the loading position. The timer clock times cycles from 10 sec. to 20 min., adjustable by seconds.

The spindle is XLO motorized—1 hp, 3,450 rpm. The hydraulic pump motor is ½ hp, 1,725 rpm. Coolant pump motor is 1/30 hp. Coolant motor, pump, and sump is a separate unit. Hydraulic motor, pump, and 6½-gal. sump are a separate unit in base of machine. Except for motors, machine is automatically lubricated.

H. M. Hill Machine Works, 98 Schor Ave., Leonia, N.J.

Materials and Parts



Ipsen Tempering Unit For Bright Work, Controlled Oxidation

This unit, for the first time, makes possible both bright, scale-free tempering, and controlled oxidation tempering from 400 to 1400 F. Known as the D-300, it is a sealed, controlled-atmosphere furnace. Since the oxygen is controlled while tempering, a bright surface is produced, eliminating the time and expense of a cleaning or pickling operation.

For bright tempering, the unit is supplied during the entire cycle with a protective atmosphere. After sufficient time at temperature, the load is cooled in the furnace until it reaches approximately 400 F. The bright, scale-free work is then cool enough to be removed from the furnace without danger of oxidation.

Furnace can also produce a controlled oxide coating, which is often desired to reduce corrosion or wear, and to produce an attractive blue-gray or blue-black appearance. This is accomplished either in a separate operation or concurrently with tempering or annealing.

After the load heats or cools to the oxidation temperature, the flow of protective gas is discontinued and a predetermined quantity of water is introduced into the unit for a specified period. The work is then removed from the furnace and air-cooled or liquid quenched.

During either air or quench cooling, further oxidation is prevented by the controlled-oxide coating. The air cooling produces a blue-gray coating, and the oil quench forms a darker blue-black finish, due to oil penetration into the oxide film.

The unit is also good for tempering non-ferrous metals because of ease in maintaining uniform temperature. Solution heat-treatment of aluminum, annealing of copper and brass, and precipitation or solution heat treatment of beryllium copper are a few of the applications.

A forced-convection system is employed in the unit. An alloy fan moves the controlled atmosphere continuously through the electrical heating element, and then through the load. This element is rated for rapid recovery when a cold load is charged.

Ipsen Industries, Inc., 715 S. Main St., Rockford, Ill.

Cutting chemical, known as Mabros 99 Spec, when applied to drills and lathe cutting tools is claimed to prevent burrs and scratches—producing a surface so smooth that polishing is not necessary. It can also be applied to grinding stones to grind diamond tools to get a better edge and longer-lasting tool.

Phillips Scientific Laboratories, PO Box 152, Arlington, N.J.

... INCLUDING

Hydraulic-contouring attachment is simpler—pilot circuits, remote-control valves, etc. have been removed .....page 188

Optical level measures flatness, straightness, and parallelism to accuracy of 0.00012 in. per ft of length .....page 188

Electronically controlled drives on a milling and die-sinking machine permit infinitely variable cutting speeds .....page 189

Chaser-grinding fixture for tangential chasers enables the compound rake and lead angles to be accurately ground .....page 189

Belt grinder for aircraft skins machines and polishes the full width of sheet .....page 190

Profiler-miller in a larger capacity has crosshead mounted on vibration-damped rail ...page 196

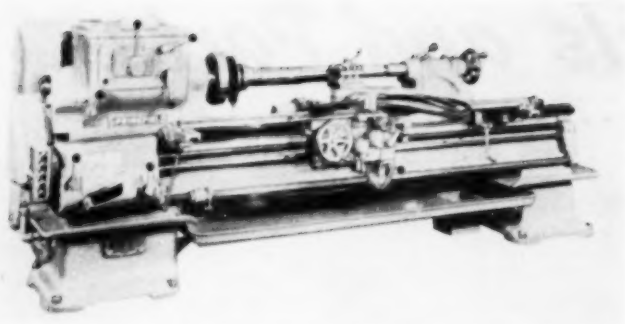
Clamp-on turning tool takes extra-heavy cuts and can use 60% of carbide blank .....page 198

Drilling and tapping 24 blind holes in a jet-engine bearing support is being done by two special machines .....page 206

... and in Sept. 29

Five surfaces of jet blades are ground in one operation on semi-automatic grinder

Flame-plating tungsten carbide on metals results in a coating that is unexpectedly shock-resisting and ductile



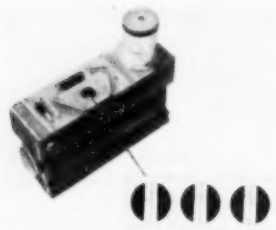
Hydraulic-Contouring Attachment Is Simpler, More Sensitive

Pilot circuits, remote-control valves, and other troublesome elements have been eliminated from the Springfield contouring attachment. A motor-driven hydraulic pump, relief valve, and oil reservoir are a single, self-contained power unit which supplies hydraulic pressure to the servo-valve and universal hydraulic compound rest. A supported and guided adjustable templet holder places templets at the front of the lathe where they are most convenient and are in full view of the operator.

With a carriage or cross-slide feed engaged, the stylus scans the full-size templet. The stylus motion is transferred through the lever arm directly to the servo-valve which meters oil flow to control the hydraulic cylinder. As the piston is stationary on the tool slide, a cylinder movement results in a tool movement, and the servo-valve is so sensitive that even the slightest pressure is sufficient to move the tool. In addition, a simple, electro-mechanical constant cutting-speed control has been developed for Springfield lathes. It governs a variable drive and maintains constant cutting speed as the lathe follows a varying contour.

Other features of the contouring attachment are: a positive backlash-free hydraulic movement, and elimination of long hydraulic lines which produce sluggish action and inaccuracies. Opposed hydraulic pressure in the cylinder holds the slide securely for heavy-duty cutting. The turret toolpost permits a wide variety of tooling arrangements including long tools for contour boring and the universal hydraulic compound swivels to the best angle for contouring each individual job.

Springfield Machine Tool Co., Springfield, Ohio



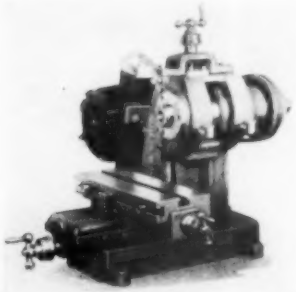
Level Measures Inaccuracies to 0.00001 in. per in. of Length

Optical level measures flatness, straightness, and parallelism—reading deviations from the horizontal of 0.00012 in. per ft. of length. The flatness of surface plates and machine tool beds, the straightness of cylindrical rolls, and the parallelism of V-ways or flats can be checked to values well within the closest working tolerances.

There is no limit to the length of work that can be checked. By moving the level along a surface 7 in. at a time (the length of the instrument) and by taking a series of readings, the entire length of the surface can be checked and plotted on graph paper.

The optical system consists of three bubble phials and two prisms so arranged that twice the usual accuracy of level reading is obtained and a very exact reference is observed. Half images of opposite ends of the air bubble are seen when looking in a phial. When the images form a perfect semi-circle, the true horizontal has been established. Separated images indicate deviation from the horizontal. In the illustration, rise is left, fall is right. The amount and value of deviation from the horizontal is measured by means of a large dia. graduated micrometer thimble and barrel.

F. T. Griswold Mfg. Co., West Lancaster Ave., Wayne, Pa.



Micrometer Feedscrews On Barker Bench Miller

This Barker Toolroom Model bench miller has three-way travel operated by micrometer feedscrews. Head travel is 3¼ in., table travel 5 in., and saddle travel 3 in. All travels can be locked. Table size is 4x12 in.

The machine is easily set up and high spindle speeds enable carbide tools to be used.

The Barker Engineering Co., 500 Green Rd., Cleveland 21, Ohio

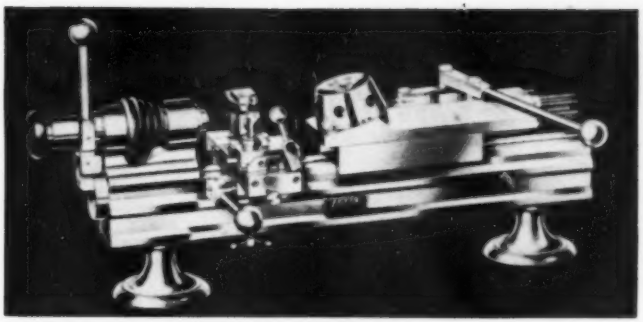
Coolant for Grinding Titanium and Other Difficult-to-Work Metals

Economy Liquid 1500 is a clean, transparent coolant specifically developed for grinding.

Production tests of many plants have included a wide variety of materials and results are said to be extremely good. The coolant is especially recommended for grinding titanium and other difficult metals.

One part of the liquid is mixed with 150 parts of water for most applications. Even with this extra-dilute mixture, wheels are reported to be open and free-cutting, and chips settle rapidly. The quality of transparency permits full visibility of work surfaces, crayon marks, scribe lines, and gage blocks. Both heavy stock removal and finish grinding are successfully accomplished with this coolant.

The White & Bagley Co., 100 Foster Street, Worcester 8, Mass.

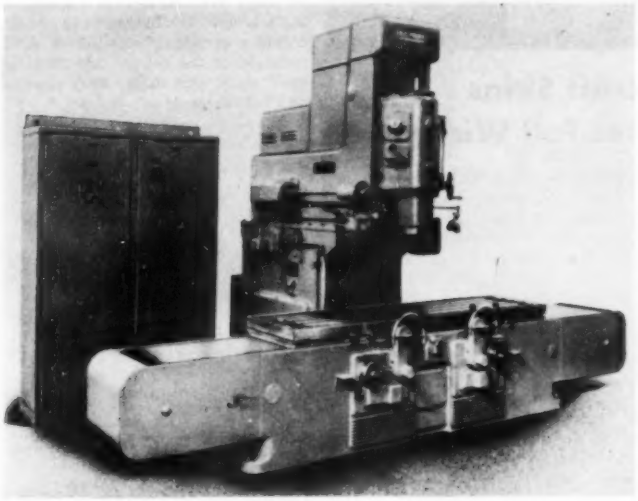


Levin Bench Turret Lathe Handles Extra-Small Parts

Small, sensitive bench turret lathe is made with two collet capacities, 3/16 or 5/16 in. It is equipped with a lever-operated collet closer, a double-tool cross-slide with a swivel compound slide, and a self-indexing, 6-position turret. The bed is 18 in. long with slide surfaces hardened.

The turret head has holes ½ in. in dia. The turret slide is made of hardened steel for accuracy and long wear.

Louis Levin & Son, Inc., 782 E Pico Blvd, Los Angeles 21, Calif.



Electronically Controlled Drives On Reed-Prentice Milling Machine

Electronically-controlled drives permit infinitely variable cutting speeds in a Reed-Prentice heavy-duty milling and die-sinking machine.

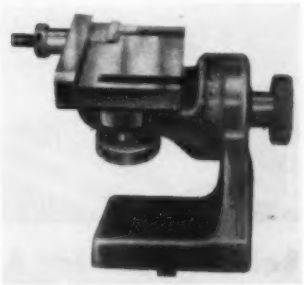
The electronic controls, supplied by General Electric, allow a selection of speeds ranging from ½ to 25 ipm without gear change. Two electronic controllers provide full-wave rectification, armature control, reversing, overload, and undervoltage protection, armature voltage-drop compensation, and dynamic braking to bring the motor to a smooth, quick stop from any speed.

The controllers guide three GE 1½-hp dc motors which drive the table, cross slide, and vertical slide. One controller directs the table motor while the other controls one or the other of the two slide motors at the choice of the operator. Shift of the latter unit from one motor to the other is accomplished by means of a selector switch mounted in a pushbutton control station.

Other GE equipment includes two 3-hp motors powering rapid traverse on the table and cross-slide; a 10-20-, or 30-hp motor driving the spindle for the cutter; and a fractional-hp motor operating the coolant-pump system.

A dust-tight, floor-mounted cabinet contains the electronic units together with standard magnetic controls for the traverse, spindle, and pump motors.

Reed-Prentice Corp., Worcester, Mass.



Landis Chaser-Grinding Fixture For Compound Rake, Lead Angles

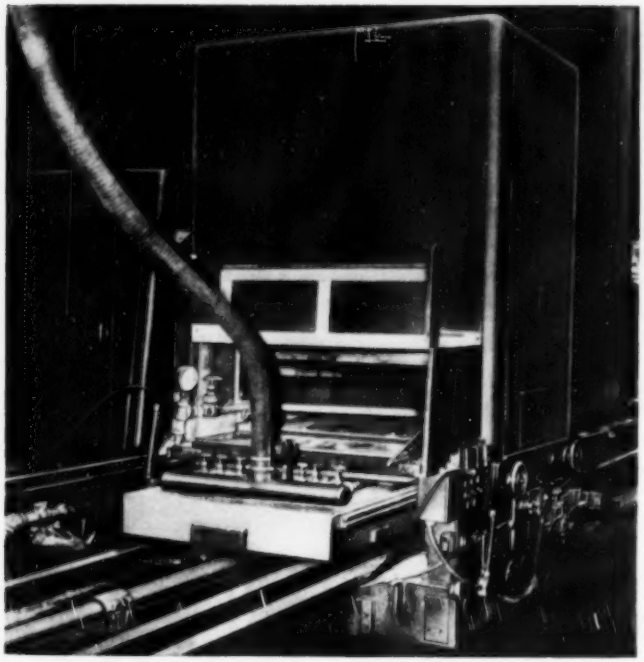
The No. 20 chaser grinding fixture provides an inexpensive and satisfactory method of grinding Landis tangential chasers. It is used to grind the compound rake and lead angles.

Supported by the base casting is a crossarm which is arranged so that the chaser platen can be adjusted vertically. This feature makes possible the grinding of any desired rake angle. The platen can be rotated through a 360° circle horizontally, thus providing an accurate means of producing the desired lead angle. Knurled knobs, which have pin holes for added leverage, securely hold the fixture in set position.

It can be readily adapted for use on any grinding machine which has a transversing table regardless of the type wheel used. The base of the fixture is made so that it can be clamped to a T-slotted table or on a magnetic chuck.

The fixture covers chaser widths from 1¼ to 4¾ in. It can also be used for the range from ⅞ to 1¼ in. by the addition of a grinding block which will be furnished on request.

Landis Machine Co, Waynesboro, Pa.



Belt Grinder for Aircraft Skins Machines and Polishes Full Width

Tapering aircraft skins through the use of abrasive belts (a joint development by The Carborundum Co and Bell Aircraft Corp) is reported to offer lower costs, better finishes, lower capital investment, and a faster production rate.

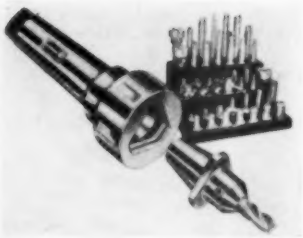
The process involves the use of a wide abrasive belt in conjunction with a "61" rubber-faced contact roll. Varying tapers can be generated easily and the finished skins are produced at a faster rate than heretofore. Cuts up to 0.1 in. in depth can be taken over the entire width (up to 72 in.) of aluminum sheets, whereas mill fly cutters, for example, can operate on only a 12- to 14-in. (maximum 24 to 28 in. using two heads) section of the sheet at one time. Moreover, polishing can be handled on the same machine simply by changing the abrasive belt to a finer grit.

Quick, accurate, and steady holding of the sheet is assured through the use of a vacuum chuck. Operator training is no great problem—one machinist and helper can do all that is required after a few days training. Since the relatively inexpensive abrasive belts are discarded when worn out, no cutting tool maintenance is required, thus any necessity for cutting-tool balancing and sharpening is eliminated. There is no time-consuming operation required for setting the belt in position to cut.

As in other machining methods, the chips are salvable and have exactly the same scrap value. The capital investment required for the abrasive-belt machine is relatively low in comparison to that for machines using existing methods. A belt machine can be delivered in eight to nine months, with additional units available every six to eight weeks thereafter.

With the abrasive-belt method, tolerances can be plus or minus 0.005 in. and fine-grit belts give microfinishes as low as 10 rms. Work temperatures are kept below 100 F, hence no metallurgical changes take place in the material. Under actual test conditions, abrasive costs were found to be from 12 to 15 cents per lb of aluminum removed—considerably lower than known costs for present methods.

The Carborundum Co, Niagara Falls, NY

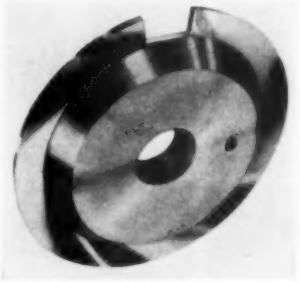


Quick-Change Toolholder has Three-Point Shank Holding

The P. D. Q. toolholder has a locking feature that permits faster tool changes and assures constant repositioning. Three-point holding of the taper-shank design eliminates run-out. The 57-piece tool set includes holders for boring, milling, and lathe work.

Boring-mill holders are Nos. 40 and 50 taper for milling machines. Turret-lathe adapters are designed to fit any turret lathe. End-mill adapters range in size from $\frac{3}{8}$ up to $1\frac{1}{4}$ in. Boring-bar holder has straight or 30°-angle bit, measures 3, 6, 9, and 12 in. in length. The boring head has accurate micrometer adjustment. Also included in the set are adapters for shell mills, end mills, drill chucks, and boring heads.

The Portage Double Quick Tool Co, 1026 Sweitzer Ave, Akron, Ohio



Carbide Cut-Off Tool for Brown & Sharpe Automatics

This tool provides strong support of the solid carbide blade. The steel hub and deep-seating blade are brazed to form a single, permanently bonded unit.

The tool is gashed to provide two cutting edges. This permits cutting off with the top of the work coming or going. Ten standard sizes are stocked. Each is designed for any size bar stock up to normal capacity of the machine.

Gay-Lee Co., Clawson, Mich.

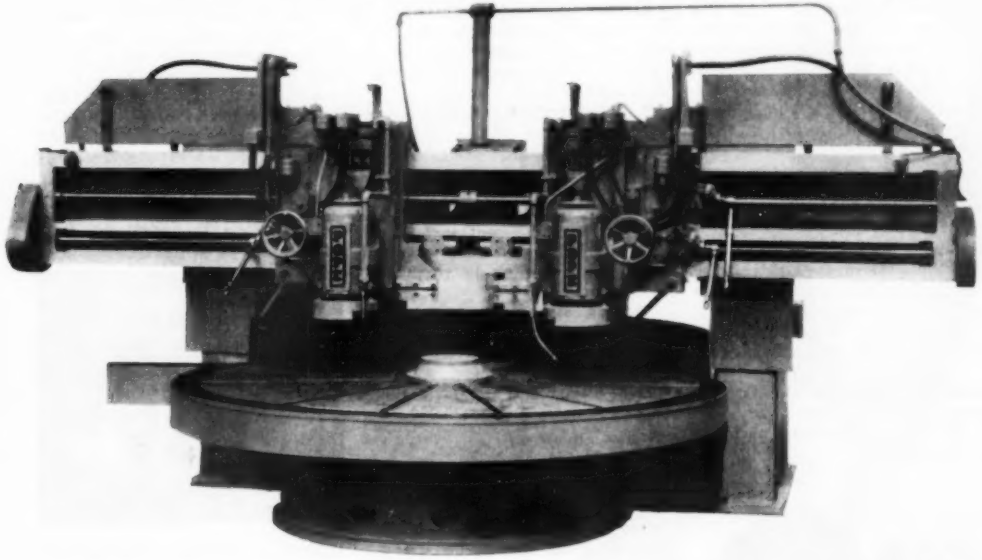
Specify POPE

2500 SERIES—HEAVY DUTY MOTORIZED SPINDLES

for YOUR BORING MILLS PLANERS SURFACE GRINDERS AND OTHER MACHINE TOOLS

NILES TOOL WORKS
BALDWIN—LIMA—HAMILTON CORP.

SELECTED POPE 2500 SERIES SPINDLES for several of their high production machines such as the 120" Niles Boring Mill Type Grinder shown below.



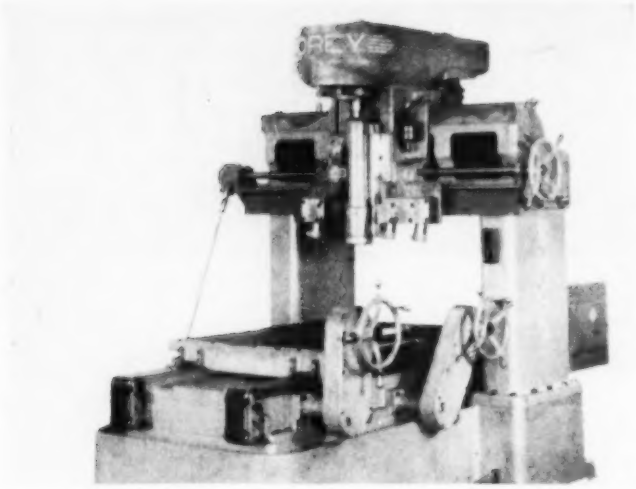
For continuous production of accurate parts and for trouble-free operation, install

POPE PRECISION SPINDLES

No. 86

POPE

POPE MACHINERY CORPORATION
ESTABLISHED 1870
501 RIVER STREET • HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION SPINDLES



Morey Announces Larger Capacity Profiler-Miller

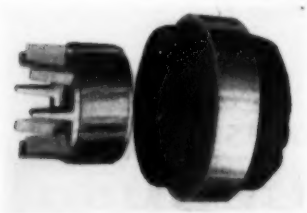
Designed specifically to meet the trend toward larger light-alloy castings and forgings, this machine provides a table 36 x 48 in. x 23¼ in. high to bridge and a maximum spindle speed of 4600 rpm. Rugged construction, together with a 15-hp motor, makes the machine equally useful for heavy cuts in ferrous materials. The motor is two-speed and operates through a backgeared drive to provide very low rpm as well.

In addition to the increased size and power, this new single-spindle, bridge-style profiler includes a number of design improvements:

1. Cross-head is mounted in balance on a vibration-damped cross-rail.
2. Bridge columns are designed for the addition of raising blocks to increase bridge clearance.
3. Ball-bearings are used throughout the machine.
4. Centralized one-shot lubrication to simplify maintenance. Machine will not run unless lubricator is operating. This feature acts to minimize repairs of the machine.
5. Both taper and straight follower holders.
6. Lamp built into bridge.
7. Both control arms are adjustable for operator's comfort and handling ease, thus reducing fatigue.
8. Simple adjustment to take up all backlash in gears, hence operator may control milling to very close tolerances.

This machine is available in any table length and will be available with side head and also with a hydraulic-tracer attachment. A large coolant tank is built into the machine base.

Morey Machinery Co, Inc, 410 Broome St, New York 13, N Y.



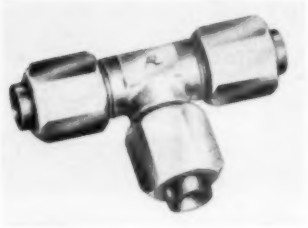
Mount Rotors and Stators In Own Motor Frame

By housing these rotors and stators in frames of their own manufacture, companies will be able to capitalize on 1) mounting versatility, 2) the shortening of the unit's overall length, 3) streamlining of appearance, and 4) lowering of manufacturing costs.

The units are designed for heavy-duty, long-life service. In the stators, for example: All winding are of fine-quality copper wire and insulation material. Coil extensions are firmly tied down. The entire stator is baked into a solid, vibration-proof unit after treatment with a special varnish.

The rotor is pressure cast into a one-piece unit containing 1) rotor bars, 2) end rings, and 3) fans. It is claimed to readily dissipate heat and assure a low-inertia, cool-running motor.

Reuland Electric Co, Alhambra, Calif.



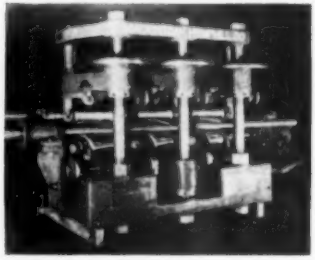
Triple-Lok Aluminum Tubing For Industrial Fluid Handling

A standard-stock line of aluminum-tube fittings for industrial fluid-handling systems and similar applications is available at substantially less cost than copper-brass systems.

Line includes male and female connectors, elbows, tees, union, and tube-end reducer for ¼-, 5/16-, ⅜-, and ½-in. outside tubing.

Fittings are provided in Triple-Lok design. Tube in such alloys as L50S is available in long lengths, with good workability characteristics for easy flaring and bending.

Parker Appliance Co, 17325 Euclid Ave, Cleveland 12, Ohio



GUIDELESS ROTARY STRAIGHTENER will straighten steel tubing in commercial pipe sizes from ½ up to 1¾ in. OD, and will also straighten brass, copper, aluminum, and other nonferrous thin-wall tubing in sizes up to 3 in. OD. Two high-speed silent-chain drives, actuated by two 10-hp DC motors, drive all six forged and hardened alloy-steel rolls. Production speeds of from 40 to 400 fpm are obtainable depending upon the type and size of material. — *Mackintosh-Hemphill Co, 901 Bingham St, Pittsburgh 3, Pa.*

LARGE ..... OR small

STANDARD

Dializer

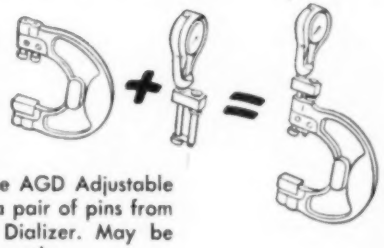
(PATENTED)

CONVERTS ANY* AGD Adjustable Limit Snap Gage

(Except Midgets)

to an *Indicating Dial* Snap Gage

GAIN ALL THE ADVANTAGES of indicating instruments at considerable saving in cost. Your present Snap Gages, plus Dializers, become *DIAL* Snap Gages!



EASILY INSTALLED in any make AGD Adjustable Limit Snap Gage by removing a pair of pins from the snap gage and inserting Dializer. May be transferred from one frame to another.

INDICATOR furnished with either .0001" or .001" graduations.

Dializers available for complete range of AGD Adjustable Limit Snap Gages (Models A, B or C)

No. 1 fits AGD Frames 1 thru 6
No. 2 fits AGD Frames 7 thru 10
No. 3 fits AGD Frames 11 thru 16

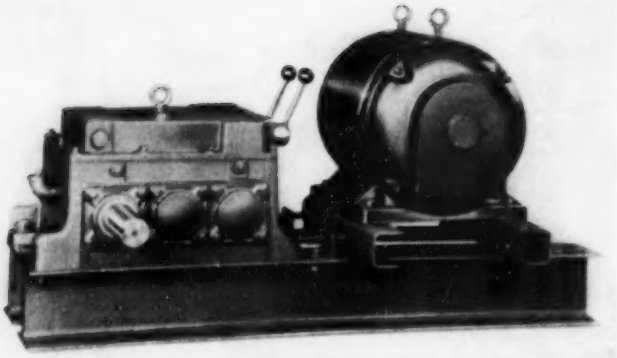
RANGE OF ADJUSTMENT of gage is unaffected.

DIALIZERS can also be used on any AGD adjustable limit length gage, progressive type.

* Large frame illustrated checks between 25⅛" and 25⅜" (beyond AGD size range). It will take a No. 3 Dializer because holes for gaging pins are according to AGD specifications.

Write Today for your copy of New CATALOG C just off the press!

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

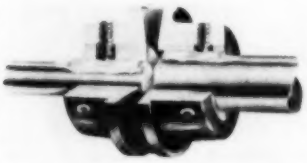


Turner Multi-Speed Transmissions For Large Power Requirement

Models 20004, 3004, and 5004 transmissions are available in ratings up to 60 hp, thus making them adaptable to a wide range of heavy applications. The standard unit is available in four speeds, with a selection of different speed ratios—but some models can be supplied with six and nine speeds.

Two different mounting brackets are available: The Type RMB is a vertical mount with the motor on a hinged plate directly over the transmission. The Type H-beam has the motor mounted in front or behind the transmission. The motor slide rails on the H-beam have both lateral and longitudinal adjustment to accommodate different motor frames and belt takeup. The transmission output shaft can be left or right, forward or rear.

Turner Machinery Co., 3401 Terrace St., Kansas City 8, Mo.



Maurey Flexible Couplings for Applications up to 10 hp

These small, compact, cast-iron bushed flexible couplings are for applications up to 10 hp. The line offers as many as 200 possible bore combinations. In each of the couplings, two cast-iron hubs are joined by a bonded-rubber section made by Goodyear.

The couplings are available in three bore sizes for use with the three standard Maurey interchangeable bushings. The smallest coupling is 1-in. bore and offers 21 possible bore combinations. With the larger 1 11/16- and 2 9/16-in. bore units there are 136 and 210 possible bore combinations possible for each coupling respectively.

New Products Div., Maurey Mfg. Corp., Chicago 16, Ill.

Silver brazing alloy is primarily intended for use in brazing chromium carbide, cast carbides, and other hard-to-wet carbides. The alloy is composed of 50% silver, copper, manganese, and tin. It has a melting point of 1120 F, and a flow point of 1345 F. There are no volatile elements and it is non-susceptible to dezincification corrosion. It has been successfully used on Type-316 stainless steel subject to dilute mineral-acid corrosion. It is known as EB silver brazing alloy. Effective results have also been obtained on high-tungsten—copper alloy, cermets, and other refractory alloys difficult to braze.

Handy & Harmon, 82 Fulton St., New York 38, N. Y.

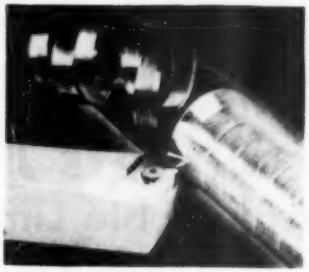
Industrial chilling machine for temperature requirements of —10 to —80 is known as the Sub-Zero Model R-70. It is equipped with a chilling chamber 30x18x33 in. deep with more than 22 sq ft of surface. Unit has a thermal capacity of 800 Btu's per hr at —70F, with temperature control adjustable from —10 to —80 F.

Sub-Zero Products, Cincinnati 29, Ohio.

Dayton Rogers Lubricant For Pneumatic Die Cushions

Excessive amount of wear on die cushions, particularly on the packings, is said to be reduced by this lubricant. A special compound, it is claimed to assure maximum life to the cup packings on the cylinders, and proper lubrication through the cylinder and piston, including other working parts. It is available from stock in 10- and 35-lb. pails.

Dayton Rogers Mfg. Co., Minneapolis 7, Minn.



Clamp-On Turning Tool Takes Extra-Heavy Cuts

A clamp-on turning tool known as Hefti-Cut can take heavy cuts when turning, facing, shaping, and boring large diameters. For example, cuts 1 in. deep at 3/16-in. feed can be taken in 41/40 carbon tool steel at 88 sfm.

A two-way carbide-blank positioning adjustment, which includes an adjustable clamp, allows a greater portion of the blank to be used before it must be discarded. It is estimated that 60% of a blank can be used.

Any manufacturer's standard blanks can be used in the tool. Also available specifically for use with the Hefti-Cut, are blanks with preformed angles. Use of these blanks resulted in an appreciable reduction in grinding time and diamond-wheel wear, and in elimination of the grinding checks caused by heavy wheel loads.

Offset of the anvil is such that solid support is afforded by the shank body. Consequently, there is less tendency for the shank to twist in the holder when leverage is exerted against the tool tip during work. Because blanks may be easily removed from the tool without removing the shank from the holder, down time for tip replacement and resharpening is kept to a minimum.

The tool is available in three offsets with several sizes for each.

The Doall Co., Des Plaines, Ill.

MEET MR. LYON, D.D.S.*

*Dealer of Diversified Services

LYON'S national organization of steel equipment dealers serves virtually every segment of business and industry—with a diversified line of products totalling more than 1500 different standard items. (A very few are shown below.)

Factories, shops, warehouses, offices, churches, clubs, hospitals, homes—these are just a few of the many markets Lyon dealers serve with quality steel products.

Engineering and production facilities are also available for special contract work.

FACTORIES IN . . . AURORA, ILL., AND YORK, PA.

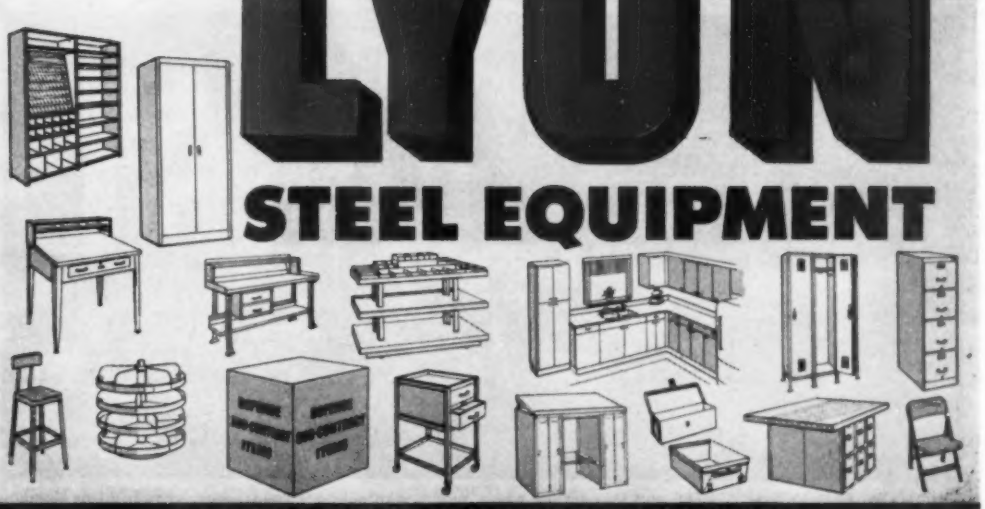
LYON METAL PRODUCTS, INCORPORATED

General Offices: 989 Monroe Avenue, Aurora, Illinois

Sold Nationally Through Dealers and Branch Offices

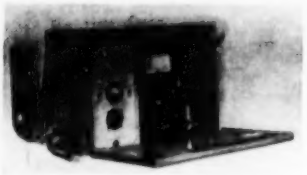
LYON

STEEL EQUIPMENT



A PARTIAL LIST OF LYON STANDARD PRODUCTS

• Shelving	• Kitchen Cabinets	• Tool Toters	• Economy Locker Racks	• Display Equipment	• Filing Cabinets	• Service Carts	• Tool Stands
• Lockers	• Cabinet Benches	• Bar Racks	• New Freedom Kitchens	• Flat Drawer Files	• Folding Chairs	• Sorting Files	• Shop Boxes
• Stools	• Storage Cabinets	• Tool Boxes	• Toolroom Equipment	• Revolving Bins	• Work Benches	• Drawer Units	• Tool Trays
• Bin Units	• Drawing Tables	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks



Surface-Resistance Indicator Measures Cleaning Effect

This device measures the surface electrical resistance, directly in microhms, as a criterion of the effectiveness of a cleaning process. While primarily designed to measure aluminum resistance, other materials with low surface resistance may also be measured.

The indicator can directly measure the total surface resistance of two sheets, or coupons, when placed between two self-contained electrodes. Resistance values of 0 to 100 microhms can be read directly off a linear scale and 100 to 1000 microhms may be read indirectly.

The surface resistance indicator shown, Cat. No. EB-4888, contains a V or C yoke to accommodate aluminum sheet or large coupon. The distance between center of press and bottom of yoke is 5½ in.

The indicator is complete with hydraulic pressure device and pressure gauge, 3-in. standard copper electrodes, vacuum-tube-type dc millivoltmeter, resistance indicator adjuster, and dc power source with suitable voltmeter and indicator bulb. Components are mounted and interwired in gray hammer-finish cabinet 13 high, 20 wide, 10 in. deep.

The unit is available shock mounted on caster type cart. The cart is provided with two convenient practical drawers. Over-all dimensions with cart, 48 high, 24 wide, 18½ in. deep. Shipping weight complete, 200 lbs.

The dc source consists of standard 6-v 100-ampere/hour automotive storage battery. A suitable battery charger is supplied, mounted and interwired.

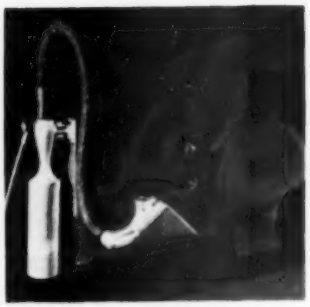
Weltronic Co, 19500 W Eight Mile Rd, Detroit 19, Mich.

Level up Your Drilling

The Speed-O-Bore, a small level encased in a machined housing, to which is attached a flexible band, can be fitted to any size drill or ratchet for precision boring.

It has three leveling surfaces and the housing is made of aluminum.

The Speed-O-Bore Mfg Co, Inc, 88-08 32nd Ave, Jackson Heights, LI, N.Y.



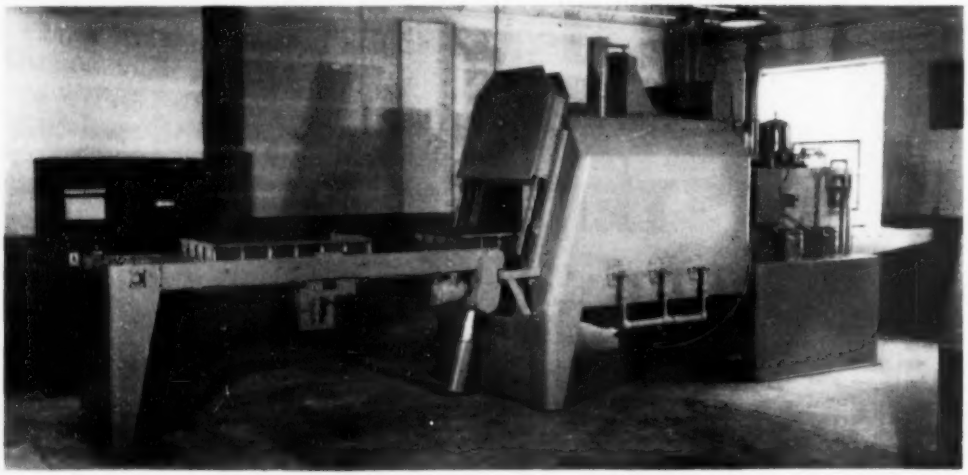
Individual Dust-Collectors

These compact units for collecting grinding dust have no moving parts and operate from the factory air supply. They can be installed in a few minutes, eliminating need for centrally located systems.

The collectors are available in two sizes: 200 Series with 24-cu-in. capacity for grinding wheels 2 in. in dia or under and the 700 Series with 56-cu-in. capacity for grinding wheels 7 in. in dia and under.

The units are quickly cleaned, requiring no refills. The dust cup can be located on the wheel guard or in some other location close to the wheel. The collector element is mounted on the side of the machine. A simple needle valve operates the units, and it can be shut off when the machine is not in use.

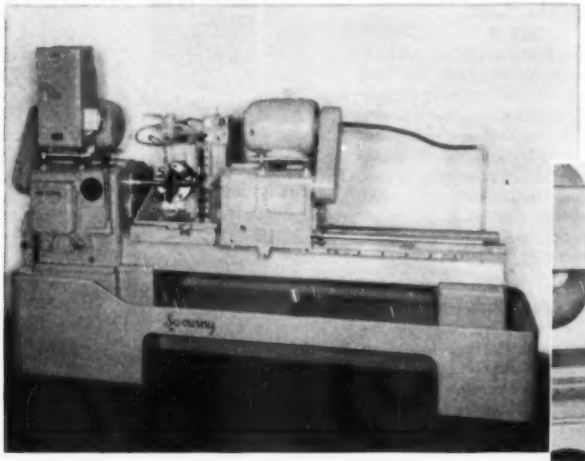
The Vulcan Tool Co, 730 Lorain Ave, Dayton 10, Ohio



AUTOMATIC SEALED ATMOSPHERE and temperature control, and automatic transfer of work from heat through the quenching cycle feature this 500-lb-per-hr heat-treating unit. Known as the Model T-500, it is available for either electric or gas-fired operation. The quench tank is direct connected to the heating chamber, separated by an automatic airdraulic-operated door. Power-driven endless chains, recessed in the hearth, transfer the work trays from the heating chamber onto an elevator rack over the quench tank. This section of the chain is equipped with lugs—when idle, it remains out of the heat zone below the hearth.—*Ipsen Industries, Inc, Rockford, Ill.*

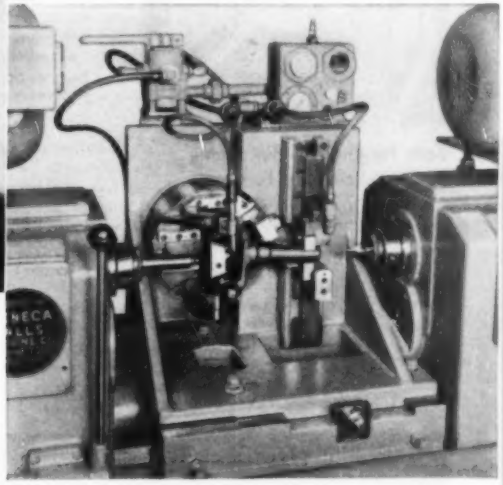
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK



◀ General view of Model CS Centering Machine equipped for centering front wheel pivots.

▼ Close up view of special work holding fixture.



MODEL "CS" CENTERING MACHINE CENTERS FRONT WHEEL PIVOTS ACCURATELY, ON HIGH PRODUCTION BASIS

Problem: To center both ends of front wheel pivots without distorting the stem end.

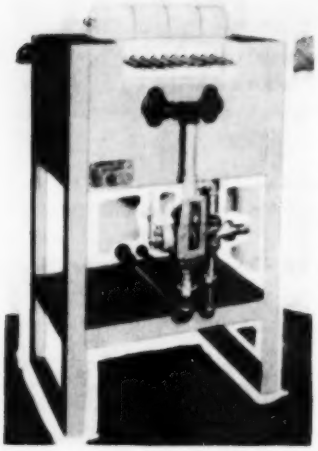
Solution: The standard Model CS Centering Machine equipped with a special work holding fixture was selected for this job. The work comes to the machine as a rough forging without any previous machining. The work holding fixture consists of a special round chuck mounted on a spindle yet free to revolve a few degrees on each side of the center line. This prevents any bending of the part when the 2-jaw vise closes on its small end. The chuck and vise jaws are operated with separate air cylinders installed on the rear of the fixture and controlled by a 4-way air valve.

The operator places the rough forging in a loading cradle, against a spring-loaded V-block, which positions it in relation to the opening between the lugs at the large end. The air valve is then operated and the large threaded stud, fitted to the inclined air-operated cross slide, forces the part back into the stationary V-blocks. A second movement of the air valve closes the 2-jaw air-operated vise. Starting handle is then positioned forward and the machine goes through its cycle automatically. Both ends are centered simultaneously.

Seneca Falls engineers welcome inquiries involving difficult machining problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH *So-swing*



Both Forging and Hardening Done in Delaware Furnace

Especially designed for the heating of chisel blanks, the Forgeatrol furnace heats the work end but retains shank temper. Direct heat from the broad, flat burners and radiant heat from the convex-shaped refractory walls are focused on the work end of the chisels. Controlled temperatures from 1200 to 2800 F are maintained. The shanks remain cool because the work tile both blocks heat loss and shields the chisel bodies.

The cold-shank heating makes possible repeated chisel redressing without subsequent shank breakage. In addition, most tools can be forged without the use of tongs.

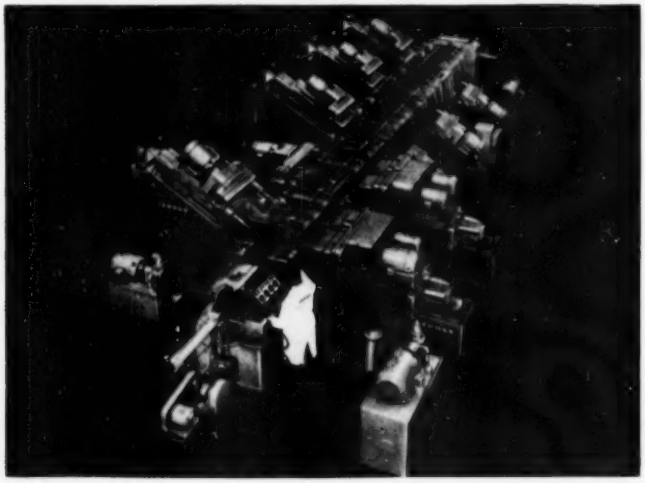
Accurate heating for both forging and hardening are accomplished with the one furnace. Temperature can be controlled within a range of from 1200 to 2800 F.

There are three types of control: 1) manual with separate air and fuel valves, 2) manual with adjustable-port, combination fuel-air proportioning valve that is readily adjustable for various gages. 3) Same as No. 2 except with automatic control through motor-operated valve and pyrometer controller.

Furnace Div, Delaware Tool Steel Corp, Wilmington 99, Del.

Equipoise gage snubbers, which utilize a porous stainless-steel disk for damping pulsating pressures, have been redesigned for high-pressure service. Units are available in two standard sizes, ¼- and ½-in. SPT; body materials are 18-8 stainless steel and brass. Steel bodies are rated at 20,000-psi operating pressure, brass bodies at 15,000 psi. They can be used as filters or as orifices to filter or maintain small rates of flow.

Equipoise Controls, Inc, P O Box 269, Bronxville, NY



THIS MACHINE DRILLS, BORES, SPOTFACES, AND REAMS 120 V-8 cylinder blocks per hr. Its 19 stations include: one for loading; ten for drilling, boring, reaming, countersinking, and spotfacing; two for gaging; one for cleaning; four idle; one for unloading. Locating, clamping, positioning, and transferring is accomplished hydraulically. A Cross machine-tool control unit is incorporated which automatically stops machine when any tools need changing. Pre-set tools reduce downtime, decrease breakage, and minimize scrap loss, since unit is automatically stopped before tools lose size.—*Cross Co, Detroit 7, Mich.*

Square D Reversing Drum Switch Is Easily Installed

The Class 2601, Type-A small reversing drum switch features an operating mechanism that is convertible for maintained or spring-return action. Screw-type terminals are provided and terminal blocks with contact fingers are easily replaceable.

The enclosure is modern in styling and compact in size. Loosening a single captive screw allows removal of the cover and easy access to three sides of the switch mechanism. A large legible nameplate, securely fastened to the cover, clearly indicates handle position and provides complete rating information. Two ½-in. conduit openings in the bottom of the enclosure and extra space inside permits easy wiring of the device.

This switch will find application where small motors are to be reversed manually. An instruction sheet riveted to the inside of the cover indicates how connections should be made for single phase, polyphase, and dc motors. Principal applications include machine tools, woodworking tools, hoists, conveyors, and processing equipment.

Square D Co, 4041 N Richards St, Milwaukee 12, Wis.

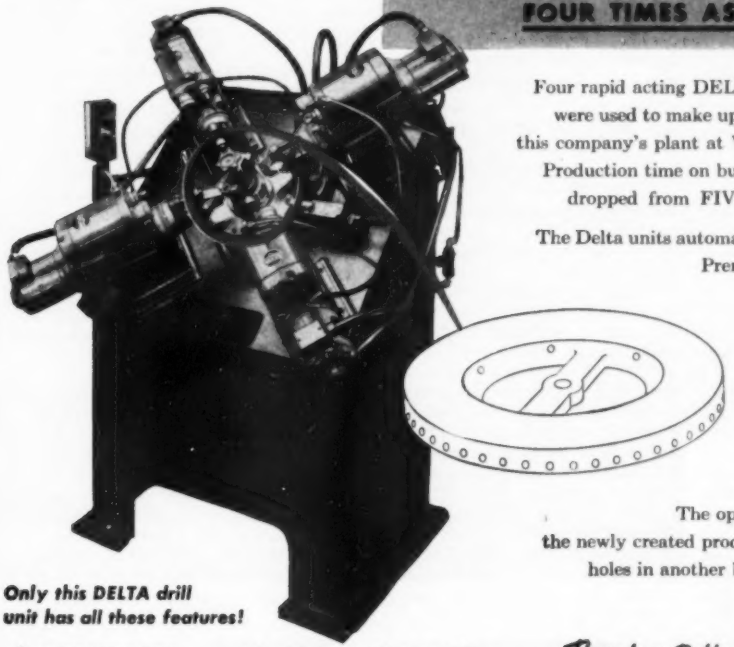
Flame-retardant plastic laminate uses a new resin formulation. The flame-retardant feature is said to have no detrimental effect on punching or other machining properties, and is said to be available at a very slight increase in cost over that of standard laminates. Testing calls for the suspension of a strip in the flame of a Bunsen burner for 15 sec and its removal for 15 sec. On the fifth repetition of this cycle, the flame must extinguish itself within 60 seconds. The new laminate is said to do so in less than one-third of that time.

Synthane Corp, Oaks, Pa.

Stove Maker Boosts Production 400%

with the NEW DELTA Air POWERED Hydraulic DRILL UNIT

PRENTISS-WABER PRODUCTS COMPANY
Now Drills Gas Stove Burner Cap Holes
FOUR TIMES AS FAST!



Four rapid acting DELTA Model 19-150 Drill Units were used to make up a special-purpose machine at this company's plant at Wisconsin Rapids, Wisconsin. Production time on burner cap drilling immediately dropped from FIVE minutes to ONE minute!

The Delta units automatically drill 48 No. 37 holes in Prentiss-Waber's standard burner caps in 0.94 minutes, and 56 holes in their giant burner caps in 1.01 minutes. After the part is loaded, the machine automatically completes 12 consecutive cycles of drill, index, drill and index—then stops itself. The operator in the meantime using the newly created production time, drills six No. 37 holes in another burner cap!—a free operation any way you look at it . . .

Only this DELTA drill unit has all these features!

- ★ **HYDRAULIC FEED** . . . quickly adjusted, infinitely variable—no recamming or changing lead screws to alter feed.
- ★ **RAPID TRAVERSE** . . . quick, accurate, positive control—no over-travel; reduces tool breakage. Approach consistently at 5 to 6 inches per second to within .010 inch of work.
- ★ **DEPTH CONTROL** . . . quick, accurate, positive—no over-travel; repeats depth consistently to within .0005 inch.
- ★ **UNIVERSAL MOUNTING** . . . units can mount in any position.
- ★ **AUTOMATIC CYCLING** . . . built-in cycle control switches provide for full electrical remote control. Eliminates installing external switches. Drilling units positively electrically interlocked with automatic indexing table.
- ★ **SPECIAL SPINDLES** . . . drive arrangements and other features are available at slight additional cost, including new two-way valve to permit spindle to function with normal rapid retraction or to back feed, as desired.

Two sizes—capacities up to 5/16-inch diameter drill and 3/8-inch diameter drill.

DELTA TOOLS Another Product

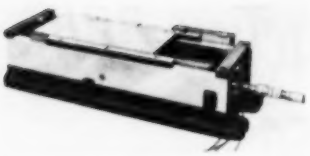
There's a Delta Power Tool for Your Job-
WOOD OR METAL WORKING

53 Machines • 246 Models • More than 1300 accessories

DELTA POWER TOOL DIVISION
DELTA MILWAUKEE **Rockwell**
MANUFACTURING COMPANY
618K N. Lexington Ave. • Pittsburgh 8, Pa.

☐ Please send the name of the nearest Delta Drill Unit Authorized Representative
☐ Please send me new Drill Unit Catalog

Name_____
Position_____
Company_____
Address_____
City_____ Zone_____ State_____



Movable Table Top On Bellows Work Feeder

Two-station, electrically controlled, air-powered work feeder consists of a moveable steel table top 11/16 in. thick by 5¼ in. wide by 12 in. long, which is guided between hardened and ground dovetail ways. Power for the transverse motion of the table top is supplied by a special Bellows BEM 5-60 air motor with a built-in Electroaire valve that is guaranteed against burn-out, yet provides instantaneous power control.

The feeder has a 6-in. transverse positioning stroke, which allows the operator to load and unload work at one table end while machining is taking place at the other. Fixtures for holding the work may be mounted directly to the table top or to oversize tops. The unit is equipped with adjustable positive stops to accurately position the work.

Known as the Transfeed, it is a completely packaged unit with built-in controls. It can be operated by pushbutton, foot switch, or synchronized or interlocked with other Bellows devices or machine elements.

All electrical connections and switches are housed in a switch box on the side of the base casting. The opposite side of the casting is milled square with the table top to provide an auxiliary location for fixtures, clamps, etc.

The Bellows Co, 230 W Market St, Akron 9, Ohio

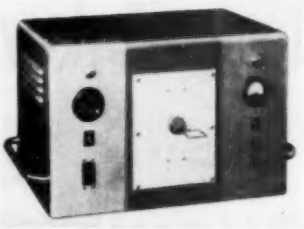
Carbide-Tipped Milling Cutter Has Interchangeable Blades

Carbide-tipped milling cutter has interchangeable blades located on periphery of cutter body, with tail end seated against an abutment in the body. Cutting forces are transmitted through this abutment. Heat-treated, body-bound screws locate blades against the abutment through a conical seat.

Bodies can be bladed for straight or alternate blade slotting, or half-side milling. Changes in rake and shear angles required for cutting various materials are accomplished by change of the rapid mounting blades. Body distortions resulting from tip brazing repairs are eliminated; blade changes cannot cause damage, as there are no wedges, serrated surfaces, and body slots.

Stock sizes available in plain and side milling cutters are in widths of ½ and ¾ in., ranging in dia from 3 to 8 in.; special sizes on request.

Millet Div, Kraus Design, Inc, 950 Exchange St, Rochester 8, NY



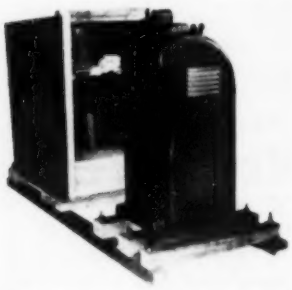
High-Frequency Heating Unit is Controlled by Automatic Timer

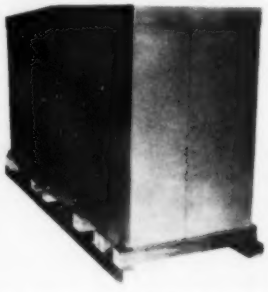
The Lewis 1500 can be used with either ferrous or non-ferrous metals for soldering, brazing, hardening, annealing, and other controlled-heat applications.

Weighing 350 lb and costing approximately 5¢ per hr to operate, the unit is controlled by an automatic timer switch which may be preset from zero to 60 sec. When the machine is turned on and the timer switch set, the object to be heated is placed within a copper work coil in front of the unit and the timer switch is activated for each exposure by a simple push button. Coils and accessory equipment are available to meet a wide range of applications. Pre-assembled or pre-positioned parts may be heated while in motion on a conveyor or turntable.

The cabinet—copper-plate finished in two-tone gray enamel—is 30½ in. long, 19 in. high, and 18 in. wide. Output is 1500 watts into a standard NEMA load; frequency, 400,000 cycles; supply, 220 v, 60-cycle, single phase. The unit is cooled by both water and filtered air blower.

Lewis Machine Co, St. Paul, Minn.





PACKAGING TECHNIQUE FOR ENGINE LATHES saves 50 to 75% in costs and 55% in the weight of the package over the old method of covering the machine with a paper bag and then housing in a wooden crate. The new method is to build a solid fiber container which completely encloses the lathe, with a wooden skid on the bottom. A simple vertical wooden frame bridging the center of the lathe is constructed and a stapling hammer is used to attach six pieces of 0.1 in. solid fiber to skid and frame. The final step is to staple and tack a lid to the top portion that is peaked to shed rain. Two men can assemble it in four hr.
—Gaylord Container Corp, 111 N Fourth St, St. Louis 2, Mo.

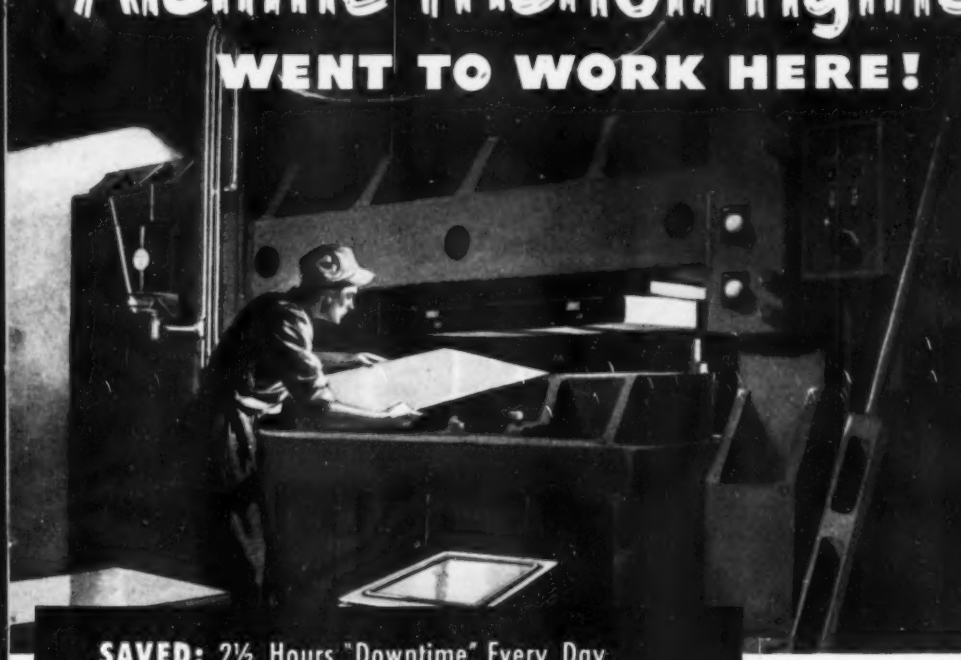
Heavy-Duty Universal Joint Is Easy to Assemble

Heavy-duty universal joint has a 6-in. hub dia and a length of 15½ in. (single joint) and 25 in. (double joint). Weight of the single joint is 98 lb, the double joint, 155 lb. A threaded small pin and lock nut make assembly and disassembly easy.

It has forks cast of alloy steel, pins and blocks of cold-drawn alloy steel. All parts are heat treated and ground, and hubs are machined to purchasers' specifications.

Curtis Universal Joint Co, Springfield, Mass.

Alemite "Friction Fighters" WENT TO WORK HERE!



SAVED: 2½ Hours "Downtime" Every Day

ADDED: 12½% More Production the First Year

ELIMINATED: Hazards of Lubrication

Safeguarding a huge Punch Press against the wear and tear of friction! It *once* was a time-consuming process – and a costly one – in a large Chicago plant. Climbing about the machine 4 or 5 times a day, it took the oiler a full 30 minutes *each time* . . . dangerous, hazardous work. Naturally, production had to be stopped. And the "shutdown" resulted in a production loss of one hour out of every eight!

Then, a trained Alemite "Friction-Fighting" specialist was called in to work with the plant engineers. After careful study, he recommended that an Alemite Mechanized Lubrication System be installed – and fully tested in its effect on production.

Since that time, the same press has run 20 hours per day – *week after week for fourteen months without a shutdown.* Production has been increased by 12½%. Lubrication time cut to an absolute minimum. And the possibility of accidents to the oiler completely eliminated.

You can get similar results! No matter what size or type of plant you operate, an Alemite Lubrication Engineer can show you dozens of ways of making worthwhile savings through more efficient handling of petroleum products. These are facts which you can readily confirm in your own time studies. The Alemite man will cooperate fully with your plant engineers in setting up a test. Contact your local Alemite Industrial Distributor, or mail coupon below – today!

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Loading . . . transferring . . . applying! Alemite Mechanized Lubrication Methods save time, save work, keep lubricants refinery-clean from barrel-to-bearing.

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For industry, Alemite Centralized Lubrication Systems add productive time to machines with faster, more efficient handling and application of lubricants.

FREE! New Booklet

Please send me:

☐ "11 Ways to Cut Production Costs."

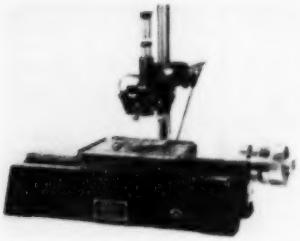
☐ Include Facts on OIL-MIST—the amazing new system that atomizes oil, circulates it to bearings under pressure.

ALEMITE, Dept. C-92
1850 Diversey Parkway, Chicago 14, Ill.

Name _____

Company _____

City _____ State _____



Pieces up to 8½ in. High Examined on Microscope

A 10½-in. working range, with acceptance of pieces 8½ in. high and up to 150 lb in weight feature this toolmaker's microscope.

Although there is no cross-travel of the worktable, it is possible to position the microscope tube over any line of motion of the work through action of the overarm, which has a reach of 11 in. Any required measurement can be made in X and Y coordinates.

Vertical alignment of the tube can be made through a sensitive plate level and a furnished test piece. This enables points to be measured which lie on different planes.

A non-rotating-spindle micrometer head can be furnished with the instrument. The 3½-in.-dia thimble reads to 0.0001 in. and by vernier to 0.000025 in.

Boeckeler Instrument Co., PO Box 171, Tucson, Arizona

Hand-Operated Spring Coiler

Hand-operated spring-coiling machine for making compression, extension, and torsion springs has been redesigned to include a structural-steel base plate, an improved method of cam adjustment, and other features.

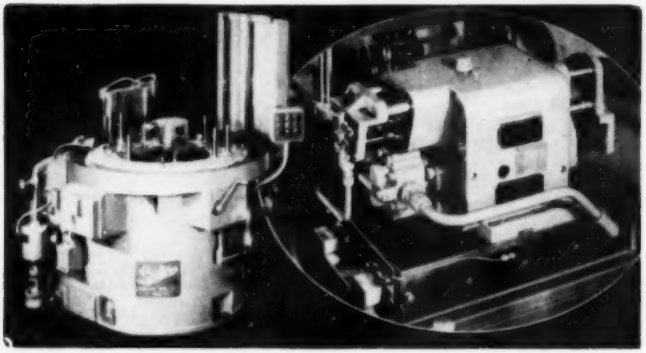
Compression springs are coiled with both ends squared automatically. Extension and torsion springs can be wound either left- or right-hand with long extended arms on both ends. The setup time is usually less than five minutes, and about 300 springs can be wound per hr.

Capacity: Wire diameters from 0.004 to 0.063 in. with outside dias up to 1 in. and spring length up to 4 in. Arbors, wire cutters, and extra points are included. Shipping weight is 50 lb.

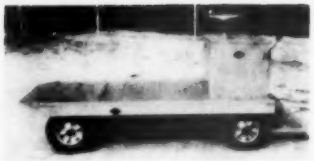
The Carlson Co., 277 Broadway, New York 7, NY

Floor resurfacing and patching material, known as Steelhard, is made of extra-tough resins and non-stone aggregates. These permit a hard, tough, resilient surface that permits the heaviest of loads to roll easily and smoothly. It comes ready to use without mixing or thinning, and is easily applied over unroughened concrete by priming the old flooring surface, spreading the Steelhard to a thin layer of ¼ in., and rolling to a smooth surface.

The Monroe Co., Inc., 10703 Quebec Ave., Cleveland 6, Ohio



HOW TO DRILL AND TAP 24 BLIND HOLES (all unevenly spaced and at different levels) on the inside of a jet-engine bearing support in a working space too small for conventional drilling units was solved by two special machine tools. A reciprocating drillhead was used, mounted on a hydraulically operated slide. Four drill spindles, driven by hydraulic motor to reduce space requirements, are mounted on each end. The need of a change-gear box was also eliminated by this method, since tool speed could be easily selected by simply controlling the speed of the hydraulic motor. Each machine is also equipped with a special rotary table which features irregular spacing—with the table electrically interlocked in such a way that the holes can be drilled only in their proper relative positions. The tapping machine functions the same as the driller except that taps are driven by a master leadscrew—* *Buhr Machine Tool Co, Ann Arbor, Mich.*



One-ton Power Truck Has 21 sq ft of Loading Surface

One-ton materials-handling power truck has 21 sq ft of loading surface, removable 24-in. stanchions which can be stowed in a rack under the platform, and room on each side of the engine housing for carrying long objects. An adapter for towing hand trucks increases its usefulness.

Chain driven by a 3.10-hp Briggs & Stratton engine equipped with star crank, its speed range may be varied by a choice of sprocket sizes. A riding platform, over-size disk brake, foot-operated accelerator, single-lever transmission control, and steering wheel with spinner are other features.

An automatic safety device brings it to instant stop in case of operator failure, eliminating danger of it running out of control.

Consolidated Industries, Inc., West Chester, Conn.

Three Hand Grinders for Use With Mounted Wheels and Points

Three lightweight, yet powerful hand grinders are for use with mounted wheels and points in tool and die shops, pattern shops, etc.

Model 137 is equipped with a 5/32-in.-capacity geared chuck and has a speed of 20,000 rpm. Model 146 also has a speed of 20,000 rpm but comes with ⅛- and ¼-in. collet chucks. Model 148 has a speed of 36,000 rpm and ⅛- and ¼-in. collet chucks.

Models 137 and 146 are designed for use with shank accessories of 1¾ in. and smaller diameters. Model 148 has a capacity of 1 in. and smaller shank accessories. All are less than 10 in. in length and weigh approximately two lb.

A steel carrying case with a convenient rack for mounted wheels and points is supplied.

Skilsaw Inc., 5033 Elston Ave., Chicago 30, Ill.

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the Industry

with the

Best Buy in AC Welders!

Offering more welding production, per dollar invested, than any competitive welder in its price class!

Proven in continuous 3-shift operation on world's toughest production welding assignments...equivalent to *years* of normal shop use!

FEATURING:

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Welding Products Division, Milwaukee 1, Wis.
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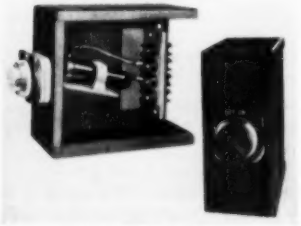
Master Control Governs Fork Truck Speed and Braking

SpaceMaster electric fork truck line features a master controller which governs speed, direction, and braking.

Operator has a choice of four speeds forward or reverse; incorporation of magnetic controls allows the master control lever to be thrown into full speed forward with smooth acceleration through each speed. Truck can move from full speed forward to full reverse with a flick of the lever. Deceleration forward through neutral and into acceleration reverse are all controlled by magnetic timing.

Mechanical brake operation is eliminated; dynamic braking is accomplished by the master control lever in the palm of driver's hand.

Lewis-Shepard Products, Watertown, Mass.

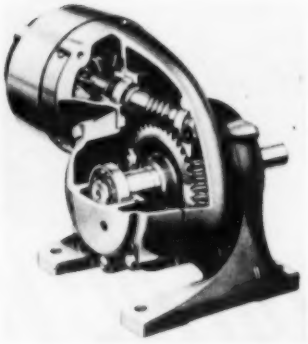


Mercury Safety Switch

This mercury switch guarantees positive safety in hazardous, explosive locations. The hermetically-sealed unit, mounted on a lever-operated armature, is actuated by a selector knob or push-button, which inclines the armature. The totally-mechanical nature of actuating linkage eliminates possibility of a spark.

Designed for vertical panel mounting, the switch is a single-pole, with either single or double-throw action. A spring action, which returns switch to original position when finger pressure is released, is featured on all push-button models.

Tigerman Engrg Co, 4332 N Clark St, Chicago 26, Ill.



Right-Angle Worm-Gear Motor

Features of the Type GW low-speed, right-angle worm-gear motor includes: a cantilever design to protect gear alignment; mounting stresses absorbed by a single-unit pyramidal base with spread-eagle feet; splash lubrication; a hardened-and-ground worm; leakproof oil seal; and asbestos-protected windings. It has self-locking brake action.

Speed ranges from 20 to 155 rpm and gear ratios up to 58:1. Horsepower ranges from ¼ to 3.

It is made in both 3-phase and single phase, and can be installed horizontally or upright. It can be supplied with a footless flange mounting, variable speed, splash-proof, or total enclosure design.

U S Electrical Motors, Inc, PO Box 2058, Los Angeles 54, Calif.

Heat-resisting silicon-base aluminum paint withstands temperatures up to 1700F. Known as Heat-Rem H-170, it fuzes with the metal on which it is applied. The paint will withstand long exposure to temperatures up to 1700F with repeated chilling and reheating. 24 hours after application, little of the vehicle seems to remain —yet a coating of aluminum is bonded to the steel. The paint will air dry in 30 minutes. Hard drying, however, will not be achieved until heat is applied.

Speco Inc, 7308 Associate Ave, Cleveland 9, Ohio

Lead-Bearing Steels

Super La-Led, now available in limited quantities, is a free-machining, open-hearth steel containing about ¼% lead and nearly ½% sulphur. It is reported to have a higher lead content than any steel produced commercially in this country. It is claimed to machine 80% faster than B1113. It can often be used to replace brass where machinability and not corrosion is the prime consideration.

The sole purpose of the lead addition in the other new steel, TS-4140 Modified, is to improve machinability — heat-treating characteristics, hardenability, and mechanical properties are not affected by the addition.

Both new steels are available cold drawn in various size ranges in rounds and hexagons.

La Salle Steel Co, 1412—150th St, Hammond, Ind.

Heat-Treating Bench Furnace

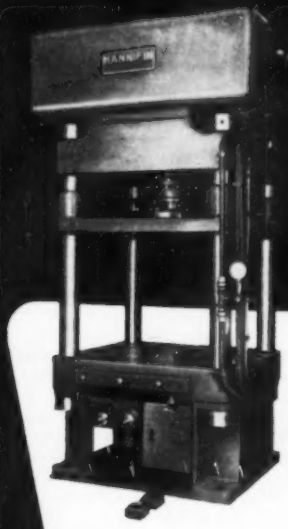
The Cooley VK-7 furnace has chamber dimensions of 10x6x18 in. and heating elements of 6.5-kw capacity at 220-v single phase on all four sides of the chamber and in the door. This provides even heat distribution and close temperature uniformity. The elements are imbedded—protecting the wires against atmospheric attack and mechanical breakage. Renewal of elements can be made without dismantling the furnace, thus avoiding extensive downtime.

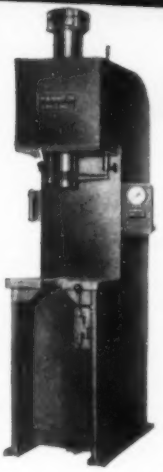
A complete package is offered, consisting of the furnace, a fully wired and integrally mounted control panel carrying a controlling pyrometer, fused line switch, and instrument fuses.

Cooley Electric Mfg Corp, 905 Daly St, Indianapolis, Ind.

FROM ½ TON TO 150 TONS...

You name the job We have the Press!





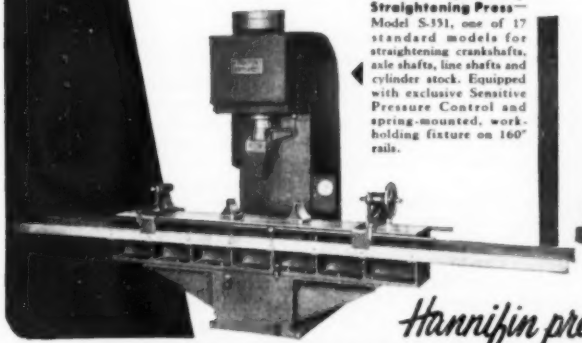
150-Ton Four-Column Press—a standard Hannifin design with semi-automatic cycle. Advance at high speed, feed stroke starting at pre-set point in stroke and automatic reversal. Dual electric push button control.

15-Ton Forcing Press—with built-in hydraulic power unit and exclusive, patented Sensitive Pressure Control. "Gap, 22"; stroke, 21"; reach, 10"; table, 19" x 22" with U slot.

Molding, straightening, forming . . . assembling, riveting, punching, staking, marking . . . there is a broad variety of vitally important production functions best handled by one of the many Hannifin standard presses. For each has the easy, sensitive and safe control, the dependable, efficient operation and the rugged strength that mark it as a leader.

The Hannifin line includes more than 75 standard models of fast, self-contained presses. It's easy to find one that fits your requirements. Special adaptations in stroke, gap, clearance or controls are easily made in most models.

To find out what Hannifin Hydraulic Presses we have for you, fill in and mail the coupon. It will bring specific information . . . promptly!



35-Ton Open Gap Straightening Press—Model S-351, one of 17 standard models for straightening crankshafts, axle shafts, line shafts and cylinder stock. Equipped with exclusive Sensitive Pressure Control and spring-mounted, work-holding fixture on 160" rails.

½-Ton and 1-Ton Air-Operated Han-D-Press—designed to meet high production schedules on assembling, staking, riveting, punching, marking and pressing. Electric control for hand or foot operation.

Hannifin presses make it Easy

Hannifin Representatives Are at Your Service in These Leading Industrial Centers

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Removable Cylinder Liners Feature Fork Lift Trucks

Diesel and gasoline-powered Buda fork lift trucks rated at 3000-lb capacity at a 15-in. load center, these two models are styled with all parts combining safety, visibility, and eye appeal.

Model FT30-15 is powered by a four-cylinder, 49-hp gasoline engine. The FTD30-15 is powered by a Buda diesel engine of identical cubic inch displacement, bore, stroke, mounting dimensions.

Features of both models include: removable wet-sleeve cylinder liners for lower maintenance cost; quick change 11-in. industrial clutch; single-lever gear shift mounted on steering columns; and center-point steering.

The models are available in five standard masts with a 72-, 84-, 108-, 114-, and 120-in. lift.

The Buda Co, Harvey, Ill.

Heavy-Duty Portable Dehumidifier With Time Delay Action

Time-delay action on this dehumidifier means that the drying material is thoroughly dehydrated and cooled before the unit switches back to the drying phase. The time delay prevents undue rise in temperature in the room during the beginnings of the drying cycle, and increases the units drying efficiency by 20%.

The unit functions by drawing humid air through a permanent dehydrating agent—a combination of activated alumina and silica gel—then discharging the dry, dust-free air back into the room.

The unit works in cycles: dries for 2½ hr; then vaporizes the absorbed moisture for 30 min, switching from the drying to the reactivation phase automatically without external control. Since the drying element is constantly reactivated by the built-in heating element, it has an indefinite life and needs no replacement.

Known as the Model 25CT, it draws a max of 0.96 Kilowatts from a 110-v, 60-cycle, single-phase line. The self-contained, 24-watt, 1/100-hp rotor fan motor is capable of moving 32 cu ft of air per min through the machine.

Dryomatic Corp, Alexandria, Va.

Cleaning compound is especially designed for use as a precleaner for steel that is to be deep drawn or extruded. Known as Detrex 61, it is used in a soak tank at 190F at a concentration of from 6 to 10 oz per gal.

Detrex Corp, Detroit 32, Mich.

Vise adapter is for holding unusual shapes in drillpresses, shapers, milling machines, and home workshops. The ball head's flat holding surface adjusts to the proper angle for holding unusual-shaped pieces of work from slipping.

The Marvel Tool and Machine Co, St Clair, Mich.

Two- and three-way chain puller is built especially for use with the OTC 17½-ton hydraulic ram. It comes equipped with a 3 ft, 3720-lb proof test, ¾-in. chain with a grab hook on one end. Self-centering hook with a screw adjustment permits a straight, even pull without cocking.

Owatonna Tool Co, 383 Cedar St, Owatonna, Minn.

Four-post tracing table has a fluorescent reflector and a glass surface that has been sandblasted underneath for diffused lighting. Two adjusting devices raise and lower the tracing surface to a comfortable working angle. Electrical parts are Underwriter's listed. Tracing surfaces in two sizes are available: 20x25 and 24x36 in. with two 20-watt and two 30-watt fluorescent lamps, respectively.

Stacor Equipment Co, 475 Troy Ave, Brooklyn 3, NY

Cold-galvanizing compound, despite lower costs, is claimed to outperform or equal electroplating, hot dipping, cementation, spraying, and painting. It may be applied with any ordinary point brush, electric spray gun, or by cold dip. Known as Galvanite, a single coating at brushing consistency will cover 625 sq ft per gal.

Galvanite Corp, 40 W 29th St, NY 1, NY

Retractable cords increase the efficient handling of portable tools—eliminating wire kinking, with resultant wear and replacement. Neoprene jacketed, the cords are permanently coiled into a spring-like shape that extends up to six times its length, and retracts when tension is lessened. The cords contain from one to six conductors and may be purchased in mandrel lengths four ft long.

Koiled Kords, Inc, Box K, Hamden, Conn.

"Tycol Angrove Cutting Oils keep automatics working at peak performance"

Correct – 100%! Tycol Angrove Cutting Oils withstand high speeds and temperatures . . . yet keep tools working with minimum regrinding. They control build-up on cutting edges. Tool life is lengthened and freer cutting made possible. Furthermore, down time for automatics, turret lathes, and similar machines is reduced.

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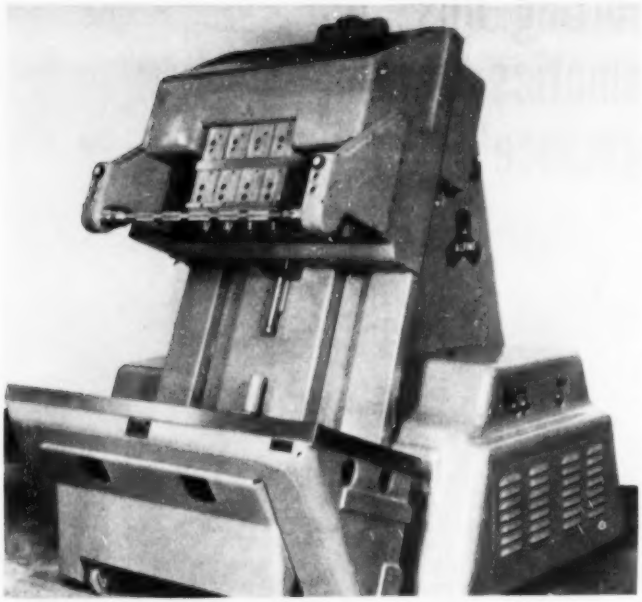


Vertical Boring Machine has Inclined Column to Ease Loading

A vertical precision boring machine, with the column inclined 20° from the vertical, developed in Germany, is now available from Morey Machinery Co. The Alfing Model VF 1/600 has an inclined column to lower the center of gravity and increase rigidity. This design also provides more accurate guiding of the spindle, and simplifies loading.

The longitudinal guide of the spindle carrier is 5 ft long. The spindle carrier has hydraulic feed and electro-hydraulic control. Full automatic cycling is provided.

The work table is integral with the column and is normally perpendicular to the spindle axis, but can be adapted to swiveling fixtures or transfer fixtures.

The spindle carrier will mount heads with diameters from 1½ to 3½ in. Special heads for long or large holes have sleeve style front bearings which move into the work. The carrier will take up to ten heads and may be equipped with back-geared heads for roughing.

Control is by a knurled shaft which extends over the full width of the machine. Automatic cycle is started by shifting this shaft lengthwise.

Morey Machinery Co, 410 Broome St, New York 13, N Y.

Saw band features a positive rake angle at the tooth tip, giving the tooth a hooked, claw-like characteristic. The hooked teeth actually pulls into the material, affording freer cutting; also, less feed pressure is required than is commonly employed. It is a hard-edge, flexible-back saw band which is not intended for resharpening because of the extreme hardness of its cutting teeth. The bands are vailable in seven standard widths ranging from ¼ to 1½ in., and in pitches, depending upon width, of 2, 3, 4 and 6. It is supplied in 100- and 500-ft lengths in stripout containers, or in convenient cut and welded lengths ready for use on a band machine.

DoAll Co, Desplaines, Ill.

Airline filter removes corrosive moisture, abrasive pipe scale and other foreign matter from ¾- to 1-in. compressed air lines. It is for use on air flows from 0 to 140 cfm at pressure of 0 to 150 psi, and temps between 40 and 120 F.

The transparent plastic bowl, which holds one pint below the baffle, enables you to see when to drain. The bowl is easily removed for cleaning or replacement. A special baffle plate traps the moisture and solids in the bottom of the bowl where they cannot be drawn back into the air line. Three filter elements are available—reinforced 200-mesh Monel metal screen is standard. 25- and 64-micron sintered-metal filter elements can be furnished.

C A Norgren Co, 3400 Elati, Englewood, Denver, Colo.

Stable, non-acrid flux for soldering copper, brass, steel and terneplate is a fast scavenger at low heat, will withstand a wide temp range without oxidizing, does not fume, and can be used wgith either torch or soldering iron. Known as Wetoil, it contains alkaline buffers. These buffers raise the pH, making the flux more stable when not in use, and the residue remaining after soldering is largely neutralized, thereby protecting the metallic bond from corrosive attack. The flux residue is soluble in water. The price is $2.25 per gal fob Philadelphia.

Farrelloy Co, 1917 N 26th St, Philadelphia 21, Pa.

Rotary pressure joint is designed to convey liquids and gases from a stationary pipe line to a revolving receptacle. Features are: external screw adjustment by means of which normal wear of rotary seal can be compensated for, floating rotary seal made of special graphite composition, pressure equalizing chamber relieves rotary seal of excessive pressure, reduces friction, wear and power consumption. Standard class—15 capacity: 150 psi, 350 rpm, 350 F; standard sizes from ⅛ to 1¼ in. ips; available in syphon and single-flow types.

Seamlex Co. Inc., 4123-24th St., Long Island City, N. Y.

Solid lubricant in stick form is used in lubricating cutting tools and threads metal fastenings. Called Tool Saver, it is a special formula of fine wax ingredients. It is designed to reduce the friction in accompanying heat occurring in machining operations. It comes in a pushout cardboard dispenser tube measuring 11 in. long by 2 in. in dia. It is applied by rubbing the pushed-out, exposed portion against the surface or edge to be lubricated. To be used on saw bands, twist drills, taps, reamers, etc.

The DoAll Co., 254 North Laurel Ave., Des Plaines, Ill.

What do you do when your v-belts get loose or break?

1 **Leave the drive alone**

You get more slippage
- ...wasted power
- ...excessive belt wear
- ...uneven sheave wear
- ...less production

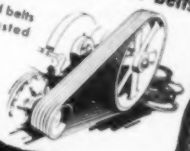
2 **Slide the motor back**

Tight belts get too tight

Life of belts and bearings is reduced

3 **Install a new set of belts**

Discarded belts mean wasted money



4 **Use VEELOS...**

Link construction permits quick installation
Easy adjustability
...provides controlled tension on each belt
...eliminates loafers
Keeps your machines running for *profitable production*

Only with VEELOS...

the adjustable v-belt—can you get *all* these operating advantages. And *only* with Veelos can you eliminate costly v-belt inventory because just four reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts.

VEELOS DATA BOOK...

The plain facts on construction, installation and use of Veelos are included in this illustrated Data Book —write for your copy.

MANHEIM MANUFACTURING & BELTING COMPANY
601 Manbel St., Manheim, Pa.

VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

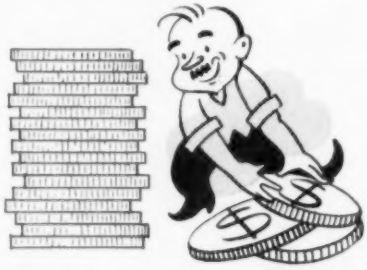
Made in all widths in three types: regular, oil-proof, static conducting. Also double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

Savings

LINCOLN PARK

An eastern manufacturer of ground glass products found replacement costs of worn steel gages to be excessive—gages were expended at a rate of 2,500 per year. At $3.50 per gage his annual cost for steel gages was $8,750.00.

Carbide gages were applied to this inspection operation and lasted at least 25 times longer than previous steel gages. After making a complete switch to carbide only 100 gages at $22.00 each were purchased per year. Thus, carbide gages cost only $2,200.00 annually and this manufacturer saved $6,550.00 each and every year on gage replacement costs alone.



For further information on how to reduce inspection costs with carbide gages, send for booklet . . . "If steel gages were *FREE!*"

MANUFACTURERS OF:

CARBIDE, CHROME PLATED AND STEEL GAGES — CARBIDE ROTARY FILES—ALSO, FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION

THE PLUS IN PRECISION

Lincoln Park INDUSTRIES, INC.

1719 FERRIS AVENUE LINCOLN PARK 25, MICH.

ROUND TABLE *Discussion*

MACHINES OR MEN?

THE NEED for skilled shop workers has increased rapidly in recent years and indications are that it will continue to do so. Along with this is the need for capable management men.

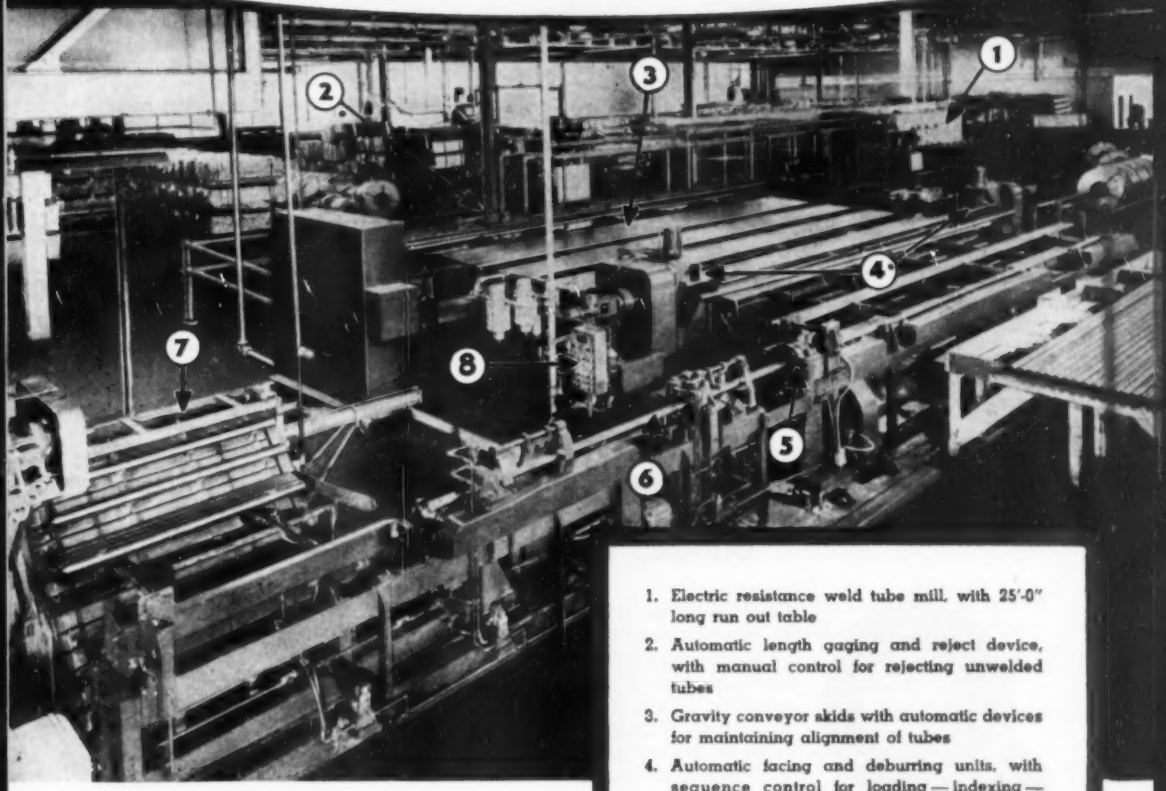
If industry is to meet these growing needs, it is necessary to develop the sources from which they may be met. This is best accomplished by both a good selection of the raw material at the source and by adequate processing through an apprentice-training program. That is why re-evaluation and re-examination of the objectives and organization of an existing apprenticeship-training program is necessary periodically from the standpoint of its worth to the company and to determine if it is meeting the needs of modern industry.

Time and current conditions are factors which may affect the present set-up of an apprenticeship system. Modernization may be necessary to speed up or develop results previously not considered in the light of present emergencies. Due to the current increased demand for workers with some degree of supervisory capabilities and knowledge, the old concept of teaching apprentices the fundamentals of machine operation is no longer sufficient. Although an apprentice needs the basic training for handling machines, additional training for handling men, or knowing how to get along with other employees also demands consideration.

A machinist apprentice course should not be confused with a foreman-training program, but training for management should also be an integral part of the formal apprenticeship-training program. It should be taken into consideration that past experience has demonstrated that an appreciable number of apprentices do not actually stay long as machinists but, within a period of years, develop into capable assistant foremen, methods men, or inspectors. However, a well-rounded apprenticeship program should not slight trade training in favor of management training or vice versa.

Later training for management as a separate entity is not believed feasible. Apprentice training should allow for inculcation of the principles of human engineering; management training should be given concurrent-

Special
DUNCAN-McKAY
Completely Automatic Cut-up Line
FOR TUBE FINISHING OPERATIONS



1. Electric resistance weld tube mill, with 25'-0" long run out table
2. Automatic length gaging and reject device, with manual control for rejecting unwelded tubes
3. Gravity conveyor skids with automatic devices for maintaining alignment of tubes
4. Automatic facing and deburring units, with sequence control for loading — indexing — clamping — cutting and unloading tubes
5. Duncan-McKay automatic tube cutoff with magnetic conveyor rolls — positive hydraulic feed and hydraulic torque converter drive for the cutting head
6. Mandrel end — with automatic length gage — magnetic exit conveyor and automatic dumping device
7. Automatic exit conveyor for cut length tubes
8. Operating control station with push button control of all automatic functions.

Finishing and cutoff operations have always proved to be a bottleneck in tube production. The McKay Automatic Cutup Line at Ford's Mound Road, Detroit Plant, provides complete automatic control of length gaging — facing — chamfering and cut to length operations for Ford's rear axle and torque tube requirements. Ford's policy of "Automation wherever Practical" really pays off here with increased production — closer tolerance control — less scrap loss and reduced cost per piece.

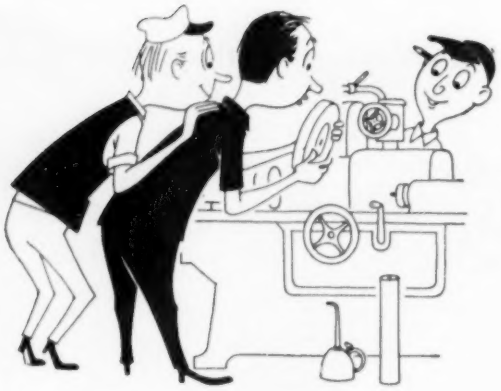
If you have a similar problem, contact McKay engineers.

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMOTIVE, FABRICATING AND STEEL INDUSTRIES

The McKAY MACHINE Company

YOUNGSTOWN · OHIO

There's something worthwhile going on here!



SIMONDS ABRASIVE CO.

Grinding Wheels

A Simonds Abrasive Company grinding wheel . . . that's what's going on. It's going on the business end of the grinding machine to end a troublesome bottleneck. Like all Simonds wheels it can be depended on to give top results on the job. It's part of a complete line containing everything you need in grinding wheels, mounted wheels and points, segments and abrasive grain . . . efficient production tools, accurately specified and made under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for free data book and name of your Simonds distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

ly with training covering shop tools and methods. Mechanical know-how plus human know-how adds up to a future foreman, or methods man, who will know management's side as well as labor's. An apprenticeship course that embraces these two equally important factors provides the necessary training for tomorrow's foremen and leaders.

Of course, completion of the apprenticeship course does not guarantee the graduate managerial status. Management training as part of the apprenticeship program is intended only to equip the apprentice more fully for such status when, and if, he is chosen for a managerial position. In any event, such training is a valuable asset to himself and his employer because it makes him a better-informed and useful employee.

Analysis and discussion of qualities that make for leadership, responsibilities and requirements of a supervisor, explanation of the human skills of management with stress on the foreman's role in maintaining good employee relations should be a concurrent part of the apprentice-training program. Knowledge of why people behave as they do, personnel procedures, the techniques that help a foreman meet the requirements of production, quality, and cost are typical of the management problems that should be offered as part of the course.

An apprentice-training program that is sufficiently flexible to allow the inculcation of management training along with shop instruction is the one that will best serve the interests of both apprentice and company in development of potential

"I realize that you were hired as a setup man . . ."

"We started to make money when we installed our first Moore Jig Borer in 1936"

SAYS AL STAUBER, MANAGING PARTNER, DACO MACHINE & TOOL COMPANY

Some were pretty small: All were very accurate... Die and Stripper for piercing 47 holes in stainless steel shutter stamping were jig bored and jig ground by Daco on Moore equipment. Hole location was within ±0.0002; hole sizes were held within ±0.0001.

Now Daco, one of nation's best-equipped tool and die shops, has 5 Moore Jig Borers and 3 Moore Jig Grinders

The toolroom which has at its disposal modern methods for fast and accurate hole location will take complex work in stride—*and make money*. Al Stauber proved that when he installed, in 1936, his first Moore Jig Borer at Daco Machine & Tool Company, Brooklyn.

Soon a jig grinder took its place alongside. Daco then had the perfect hole location partnership—the jig borer to locate and bore the hole accurately... and the jig grinder to relocate and grind it after hardening (and also grind contours).

Now famous for instruments and instrument tooling, Daco uses 5 Moore Jig Borers and 3 Moore Jig Grinders for 90% of its hole locating and a good percentage of its contour grinding operations. All have been operated at least 50 hours weekly the last four years; several, through two shifts. Daco also has two Moore Panto-Crush Wheel Dressers and a Moore Die Flipper.

You can prepare for tomorrow's competition *by writing today* for literature describing Moore Jig Borers and Jig Grinders.

Moore Special Tool Company, Inc., 738 Union Ave., Bridgeport 7, Connecticut

ADD MOORE TOOLS TO YOUR TOOLROOM

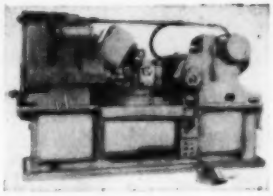
JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

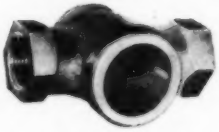
...and parts are finished without rehandling on

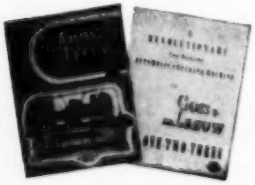
GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.







A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A

supervisors and workers who understand and appreciate the problems of both labor and management.

Harry Kaufman
Philadelphia, Pa.

•

SHOP VEEP

What are points, pro and con, for deputizing a methods man to take some of the routine load from a foreman's shoulders? Does it detract from the foreman's authority, or will appointing a middleman result in smoother operation?

MODERN MANAGEMENT realizes that the best way to prepare for a highly competitive future is to develop intelligent workers into a well-informed, far-seeing, cooperative and efficient working force. In developing men into better workers, the foreman is management's contact man as well as leader. He is the natural person to whom the workers will turn if they want to know something about the company and their jobs. The well-informed foreman is the best possible insurance that the shop will function in an efficient manner.

However, the current demands for increased production are placing additional burdens on foremen. New problems of manpower, productivity, and material requirements are adding to the usual crop of supervisory headaches. In line with alleviating the burdens placed on the foreman's shoulders by increased production requirements, it is believed that having a methods man working for the foreman is definitely a step in the right direction.

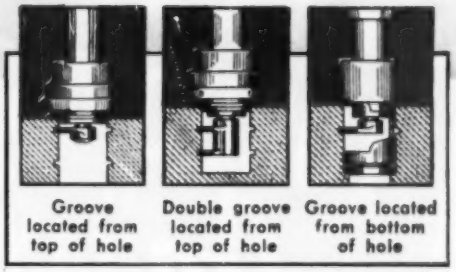
Management should see to it that the load on the foreman does not become too heavy, that the organization is set up to cope with new problems without undue strain on any one individual. An important step in taking some of the work off the

"Maybe I shouldn't have kicked it."

Waldes Truarc Internal Grooving Tool

for precision cutting of internal grooves in bores and housings

FAST! ECONOMICAL! NEEDS NO SKILLED LABOR!



Groove located from top of hole | Double groove located from top of hole | Groove located from bottom of hole

Internal groove-cutting becomes the simplest of operations with Waldes Truarc Internal Grooving Tool. Easy to adjust—easy to operate...readily adaptable to individual requirements.

Designed for use in any hand drill or automatic drill press and screw machine... assures a concentric recess without injury to metal. Operates by fingertip pressure—especially suitable for unskilled operators.

The Waldes Truarc Grooving Tool when used in an electric or pneumatic hand drill, can be taken to the job eliminating disassembly and excessive handling...resulting in all-around savings in time and costs!

Write now for new 12-page Catalog giving mechanical details, cutting sizes...extra features...full information

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GROOVING TOOL

WALDES KOHINOOR, INC., 47-16 Austel Place, Long Island City 1, N.Y.
Waldes Truarc Grooving Tool
Manufactured under U. S. Pat. 2,411,426

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Please send me your new 12-page Catalog on Waldes Truarc Internal Grooving Tool.

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FINEST

- for SPEED
- for ACCURACY
- for VERSATILITY
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TORQOMATIC by Jarvis

AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

Jarvis POWER TOOLS

TAPPING ATTACHMENTS • TAPS and DIES • ROTARY FILES FLEXIBLE SHAFTS and MACHINES • TUNGSTEN CARBIDE REAMERS and MILLS • DRILLS BORING BITS

Finest for SPEED: Taps more quality threads per hour, more holes than any other tapping attachment.
Finest for ACCURACY: Attaches firmly to drill press or tapping device.
Finest for VERSATILITY: Taps anything from soap to nickel steel without pressure on tap—prolongs tap life.
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Finest for MAINTENANCE: Requires little or no maintenance.

TORQOMATICS, when used with Jarvis TAPS, make the finest possible combination for low-cost, high-quality tapping. Send for free, illustrated, descriptive literature to The Charles L. Jarvis Co., Middletown, Conn.

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MIDDLETOWN IN CONNECTICUT

shoulders of the overburdened foreman is to relieve him of the necessity of continuous attention to methods improvement. What could be more logical as a step in this direction than to have the foreman pick one of his best men as a methods specialist who would be available to the rest of the workers? He could be consulted by the men regarding ways and means of doing a job, and thus relieve the foreman in these matters. Having a good and experienced worker act as a methods liaison man full time will also help to standardize the best methods for doing the work and develop new ways for cutting costs.

When it comes to methods improvements, we are prone to look for the spectacular, and to forget that day-by-day cultivation of good shop practice really pays the big dividends. It is therefore believed that the appointment of a methods man to assist the foreman will pinpoint the necessity and desirability for finding improvements in shop methods. The every-day job of continuous analysis and follow-up cannot but create sound thinking and precise action on the best methods to employ for given jobs.

An experienced and capable workman, given the specialized job of methods liaison will do much to develop the easiest and most practical way to perform a task. This means that he will endeavor to eliminate, wherever possible, unnecessary lifting, turning, standing, and bending, because these factors create fatigue and lessen production. By paying particular attention to the maximum use of fixtures, special tools, and gages required to do a particular job, and standardizing the best, the

"3¾ inches . . . that's a full half-inch higher than last week's government forms."

cost of doing the job can be reduced and efficiency increased.

A good methods man will help to standardize the metal-cutting practices in the shop. He will see that tools are selected by proper type, and ground so that they produce uniform results on similar parts and in good relationship on all other work. Although the methods specialist does not make all the decisions on tooling practices, he should establish standards for the types and uses of all tools. He can also devote attention to setting up of machines. Time-saving possibilities arising from improved setup facilities can be achieved through added mechanical devices and convenient availability of tools, straps, clamps, bolts, etc. Anything done along the line of added mechanical devices helps to shift skill from the operator to the mechanical means of doing the job.

The idea of having a methods liaison man working for the foreman deserves a trial. His job, however, can only be justified if it takes work off the shoulders of the supervisor instead of burdening him with more responsibilities. A methods man who can perform his mission as a specialist and help raise the efficiency of the department will be a welcome helper for today's overburdened foreman.

Harry Kaufman
Philadelphia, Pa.

•

So Ed had a strange event happen in his department when one of his men had the nerve to suggest that Ed take on a man so he could be relieved of some of his work. Perhaps this man was contemplating a job as assistant foreman.

Had Ed been mindful of the best interests of the firm, he would have had a thorough-going man as his assistant and have had him trained so that if he, himself, should fall ill, the man could direct the actions of the department.

In a case I recall, a foreman had charge of four branches of the work; automatics, engine lathes, boring mills, and shapers. Both light and heavy work came to him to get rough and finishing cuts. The foreman had consistently declined to take on an assistant for fear that he might be replaced.

When told that he must eventually take on a good man as a helper to himself, he moved in quite an original way. It was not his wish to attract attention to his actions, so they were very gradual and quiet.

There were eight heavy lathes and

ACCURATE SQUARES
CONCENTRIC SHANKS
UNIFORM FLUTE SPACING
CONTROLLED HOOK
PRECISION GROUND CHAMFER
Custom Made at No Extra Charge
Jarvis TAPS
AN INDUSTRIAL TAP FOR INDUSTRIAL USERS
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TAPPING ATTACHMENTS · TAPS · FLEXIBLE SHAFTS
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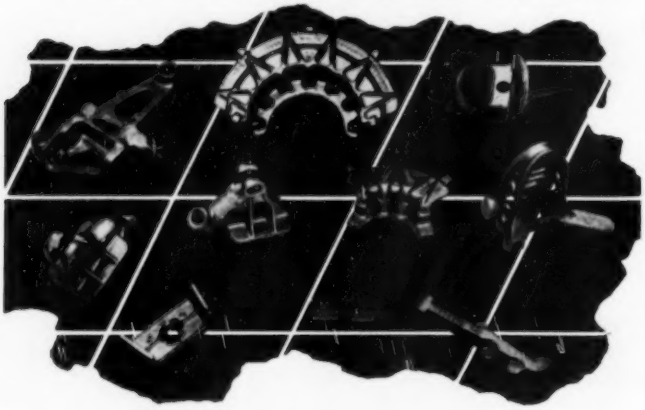
THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

UNITCAST

Daily rides the AIRLANES

(Aircraft castings used directly or as an accessory attachment)



UNITCASTINGS

..ENGINEERED TO "TAKE IT"

Each of the above castings is the result of cooperative designs embodying the best-known foundry techniques available to assure the production of HIGH STRENGTH, MINIMUM WEIGHT, DEFECT-FREE castings. Each part is either percentage checked or 100% checked by radiographic and magnetic particle inspection.

Unitcast HAS met and WILL continue to meet the demands of industry, producing pre-determined TOP QUALITY castings, as shipped, and with personal follow-up to check machinability, fixture fit, assembly fit, etc., in YOUR PLANT.

Your successes reflect on our books. May we offer our services to challenge any knotty problem your product may present to the castings industry.

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QUALITY STEEL CASTINGS

Give us a chance to offer a "cast steel" answer for your parts problem. Our suggestions while your product is in the design stage will pay continuous dividends.
Write or call today. Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. In Canada, Canadian - Unitcast Steel, Ltd., Sherbrooke, Quebec.

UNITCASTINGS ARE FOUNDRY ENGINEERED

14 light ones, so he put one man in charge of each class of these. He divided the work of the automatics, as there were 20 of them, he allowed each man ten. The boring mills and shapers he awarded to one man's direction, for there was not as steady work on these as there was for the automatics and the lathes.

By these actions he had appointed five of the best men under his direction to be his assistants. They were all experts in their own lines so he was not apprehensive at all about the amount of work which they would produce, nor about the quality of it.

The superintendent, being wise as to what was going on, smiled up his sleeve and said, "Before making criticisms, let's see just what will be the result of leaving Jim alone. Maybe we'll learn something which will be new to us."

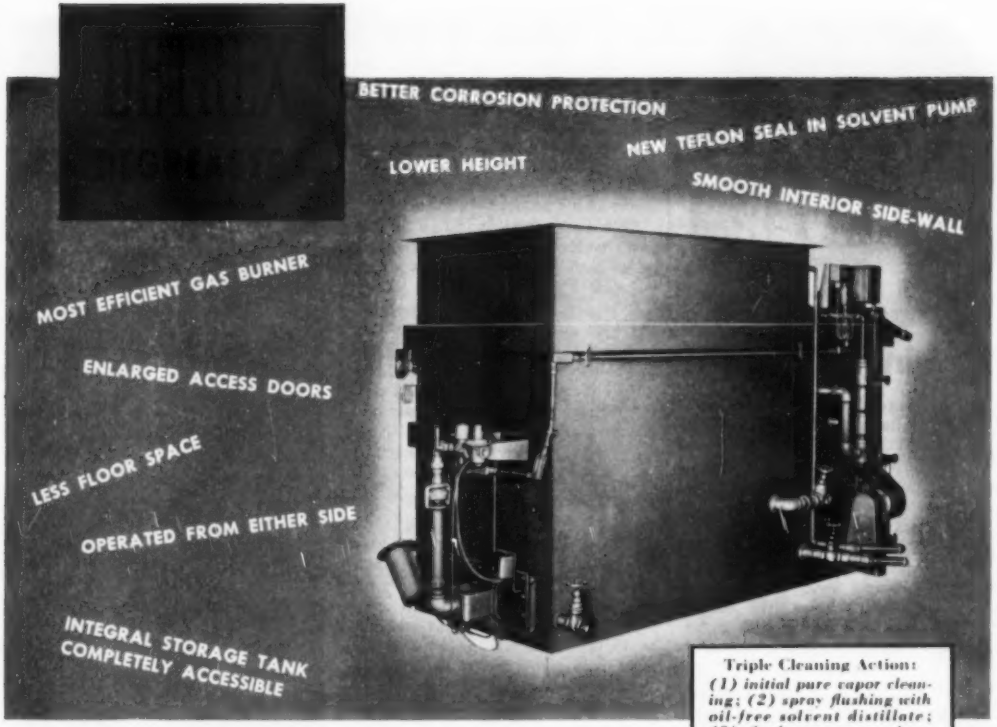
For about a week, production dropped off about two per cent. Then, at the end of two more weeks, production was normal, while at the end of four weeks, production rose one half of one per cent above normal. At the end of six months, production was two and three tenths per cent above normal on the regular line of material.

Now, let's analyze this affair a bit in detail.

The man on the automatics geared his machines to operate at five and a half per cent greater speed; no harm was done to any of them and the product passed all necessary gages, for the inspection of this work was very strict.

The assistant on the mills and shapers took his most experienced and oldest mechanic aside and asked for suggestions. The old man tried his ideas for having the tools on the shapers ground a bit differently, and

"When they say 'Direct from factory to consumer,' they mean it."


BETTER CORROSION PROTECTION
LOWER HEIGHT
NEW TEFLON SEAL IN SOLVENT PUMP
SMOOTH INTERIOR SIDE-WALL
MOST EFFICIENT GAS BURNER
ENLARGED ACCESS DOORS
LESS FLOOR SPACE
OPERATED FROM EITHER SIDE
INTEGRAL STORAGE TANK COMPLETELY ACCESSIBLE
Triple Cleaning Action: (1) initial pure vapor cleaning; (2) spray flushing with oil-free solvent distillate; (3) final pure vapor rinse.

9 great new features ...in the VS 800 series

Industry's most popular type of hand-operated degreasers—the Detrex VS 800 Series—have been redesigned with 9 important advancements to afford still more economy of operation, greater utility and easier maintenance.

New atmospheric gas-fired immersion tube heating elements increase heating efficiency 50% (in some cases as much as 100%), save fuel, and permit thermostatic control of the heating tube. (VS 800 degreasers also are quickly adaptable for electric or steam heating.)

The interior of the degreaser, including the distillate reservoir, is coated with FF-1 . . . the new Detrex non-porous coating which is completely moisture-resistant and unaffected by degreasing solvents. It has shown no failures after severe and prolonged field use.

Redesign of the Detrex VS 800 has removed all interior projections, lowered working height, and provided flexibility of operation from either side. Compact construction has reduced floor space, the storage tank has been built into the unit to eliminate a separate container, and maintenance has been made easier by the enlarged access door. A new pump design uses corrosion-resistant materials throughout, and features a new teflon mechanical seal to eliminate solvent leaks.

These are but a few of the reasons why VS 800 degreasers lead the field. Get all the eye-opening facts about the improved features, wide range of sizes, and many uses of these redesigned degreasers, as well as other Detrex standard and special models. Call your local Detrex field office or write direct to DETREX CORPORATION, Box 501, Detroit 32, Michigan. D-1

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DEGREASERS • DEGREASING SOLVENTS • WASHERS
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. . or Released in an Instant

Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts *never* work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study *your* fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

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GREER Stop Nuts

this worked out in a splendid manner. The party who had charge of the lathes, put more work on the heavy ones and hogged off much more metal than the light lathes would stand in roughing cuts. For this work, the man made gages of cheap material, many times of wood, so no operator of a lathe would make errors in his product.

Perhaps a small addition in the pay envelope of these men who acted as overseers, did much towards more production.

It is possible that Ed considered the idea of being let out or that some other equally disagreeable act might be worked so that he would be forced to quit. Apparently, Ed considers himself to be the best foreman in the whole country.

Robert Lee Grayford
Worcester, NY

•

If Ed is a good foreman, he has selected his men to meet the demand for skill in different branches of toolmaking.

No single foreman could possibly be an expert in making all kinds of tools, nor could any of his men be capable of advising fellow workers about the best methods and tools to be used on all occasions. Not even a tool engineer or a methods engineer is able to do so.

If Ed has so much training and paper work to do that he is not able to supervise the work in his department, it is time for him to get an assistant to select a man for each job who is a specialist on that particular kind of work, and give him the proper instructions.

Of course, if the toolroom is so small that the expense of employing an assistant would be unduly heavy, the manager could appoint a good man on Ed's recommendation to help him part of the time. On the other hand, in a small place, Ed would probably not have so much paper work to do.

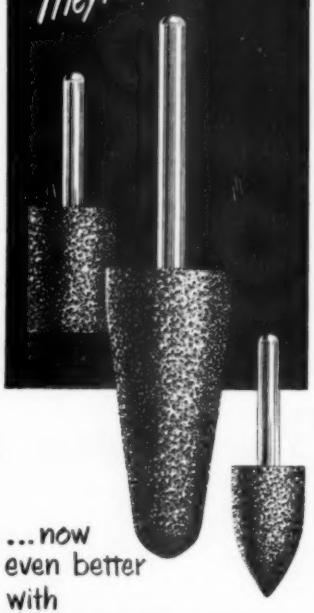
A super-idea man working as a toolmaker in any toolroom would undoubtedly be a rare occurrence, as a man of such high caliber wouldn't be working as a subordinate under a foreman. He would have advanced to a methods engineer, or something still higher.

If Ed is lucky enough to have such a man in his crew, he should, of course, use him to the best advantage to the company, and see that he is paid accordingly.

I don't think any really able man would feel inflated because his

Chicago MOUNTED Wheels

They're the Best



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Choose Chicago Mounted Wheels – bonded with 79E Bond – and you'll never buy any other! This tough new grinding wheel bond, exclusive with Chicago Wheel, has taken the industrial world virtually by storm, doing a better grinding, burring and finishing job faster. Greatest selection of sizes and shapes for every application. Best of all, deliveries are good . . . ready when you need them. Try 79E Bond Mounted Wheels.

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OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

You get *BIG* Press Standards of Construction and Performance

in —

TRADE **Verson** MARK

O.B.I.'s

When you can combine the versatility of an O.B.I. press with the construction and performance standards of big, expensive machines, you get a real production tool that will give you the best possible long term economy . . . And that's just what you get with Verson O.B.I.'s. Just check these features—gears running in oil . . . heavy all-steel welded frame . . . machine cut steel gear and pinion . . . split cap main and crankpin bearings . . . mechanically interlocked pneumatic clutch and brake unit . . . full electric controls . . . many others.

Six models, with capacities ranging from 90 to 250 tons are available.

While the demand for Verson Presses is at a very high level, now is a good time to start your long range planning. Verson engineers will be pleased to go over your needs with you.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

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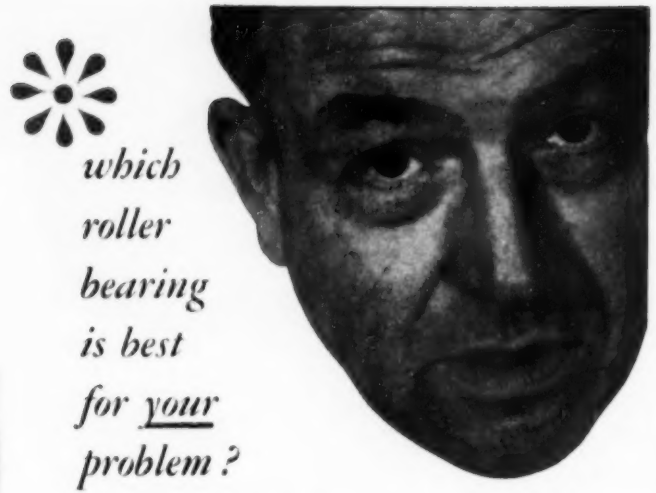
A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING
DIE CUSHIONS • COMPRESSION AND TRANSFER MOLDING PRESSES



which roller bearing is best for your problem?

. . . obviously one that is best suited to your machinery's particular requirements. You would want maximum capacity, smooth precision performance, long life, dependability with the least maintenance and of course an adequate range of sizes. McGill MULTIROL Bearings have been delivering this insurance for successful machinery for over 20 years. With today's increasing production demands it will pay you to specify MULTIROL. Write for complete information in the new McGill Catalog No 52 today.

ability was utilized. Such conditions are more likely to develop in the brains of bluffs who think they know everything, but cannot pass a real test.

A E Fristedt
Stockholm-Bromma, Sweden

•

MANY OF our most successful businessmen have never seen the inside of a high school; they have attained success by hard work. They are living proofs that it is not problems that bother us most—it is people. We can solve our problems when we learn how to deal with people. People want to be appreciated for some particular ability.

The president of a successful business doesn't necessarily know everything about the product; sometimes he knows very little. He does, however, have to get the right kind of people around him, and get the most out of those he employs.

A foreman's success depends on what he is able to accomplish with the employees in his department. His degree of success in quality, production, safety, and costs depends in the most part on careful handling of personnel. He must make sure the employee knows all there is to know about each job he is assigned to do.

He should appoint a leader who might be paid 10% over operation scale. If the foreman properly trains the leader to help him in an emergency, he adds to the efficiency of the department. When the foreman attends a meeting, or is sick, or on vacation, the department still runs smoothly.

This also affords the foreman more opportunity to study better ways of

Continued on page 231

"I understand this new group has a broadened scope."

This man can show you...

How to add product strength and end installation complaints with simpler P-K assembly

In this aluminum combination storm sash and screens, 25 P-K Type F Screws are used in original assembly, and 11 P-K Type A Screws for installation. At all points fastenings are subject to unusual strain and tension. Manufacturer says, "By far the lowest in cost and most practical method from every standpoint."

Type F Hardened Self-tapping Screw. Cuts a standard machine screw thread as it is driven. One of five standard types of P-K Self-tapping Screws, it is also available with Phillips Head.

If yours is one of the many products that are made for installation by mechanics or ultimate users, you can get good advice on the cure of fastening headaches from a P-K Assembly Engineer.

He'll show you why the simpler P-K method turns complaints into compliments. You eliminate such artisans' gripes as retapping of paint-clogged holes, fussy nut-running on bolts, breakage and slot-shearing of soft wood screws.

He'll show you, too, why P-K Screws in your original assembly make a stronger product, better able to stand the abuse of heavy-handed work crews, with a big saving in fastening time.

Let the P-K Assembly Engineer help you make your *plans* for efficient assembly *pay off* in customer satisfaction. He'll call at your request. Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y.

DELIVERIES ARE BETTER CHECK WITH P-K FIRST

Your P-K DISTRIBUTOR *has good news. His stocks of P-K Screws are steadily improving. The size and type you need may now be readily available. Ask him about it. Plan now to make your assemblies with the original, quality-controlled P-K Screws. Remember— "If it's P-K . . . it's O.K."*

P-K
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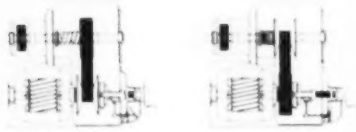
The Original **SELF-TAPPING SCREWS**

FOR EVERY METAL AND PLASTIC ASSEMBLY

REEVES Vari-Speed Motodrive®

REEVES Vari-Speed Motodrive incorporates a proved operating principle



Minimum speed Maximum speed

REEVES Vari-Speed Motodrive utilizes proved REEVES operating principle of a V-belt driving between two pairs of cone-shaped discs which are adjustable to form an infinite number of driving and driven diameters. Discs are mounted on parallel shafts. One shaft receives power at constant speed from motor—other delivers power at infinitely adjustable speed to gear reducer from which desired speed is transmitted to driven machine.

Hydraulic Automatic

Electric Remote

Electrical Tachometer

Available with a wide choice of controls and indicators: REEVES Motodrives—available in vertical or horizontal models in capacities to 25 hp and speed ratios as great as 10 to 1—are furnished with choice of handwheel, hydraulic automatic, mechanical automatic, electric remote, or extended handwheel control. Speed indicators include choice of standard dial type, speedial handwheel, and electrical tachometer, AC or DC.

Any speed you want . . . with a turn of a handwheel or touch of a button_**with this modern unit that combines motor, speed-changing mechanism and gear reducer in one package**

Rate, quality, and uniformity of production improve *immediately* when your machines are equipped with REEVES Vari-Speed Motodrives. With the turn of a handwheel or touch of a button, *and without stopping the machine,* the Motodrive delivers any speed over a wide operating range . . . holds it accurately and positively. Enables any machine to do more different jobs, handle more shapes, sizes, and materials . . . permits each operator to work at his highest, most efficient rate of speed . . . increases machine output and earnings.

For machines you buy or build, obtain *all* the benefits of stepless speed adjustability by specifying REEVES Vari-Speed Motodrive. Send for free catalog. No. A80-G.

ALSO FRACTIONAL H.P. MOTODRIVES

These units are of the same design and construction as the standard Motodrives—but are smaller to permit application to light machinery. Vertical and horizontal designs in ¼, ⅓, ½, and ¾ hp sizes; speed ratios as high as 10 to 1. Furnished with base for either floor or wall mounting.

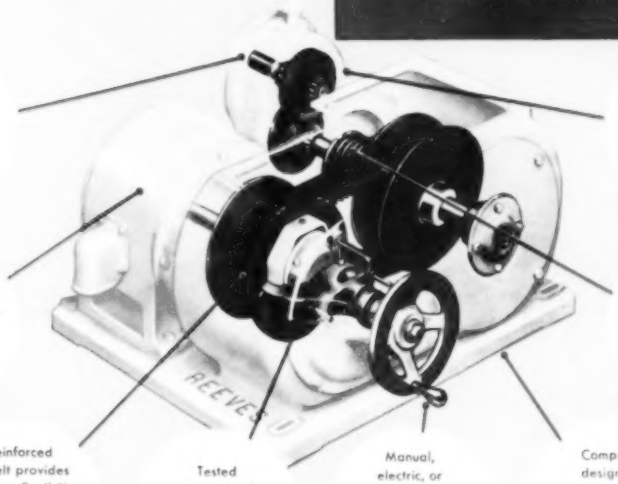
REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized leader in the specialized field of variable speed control.

accurate • variable

REEVES

SPEED CONTROL



Output shaft speeds as low as 2 rpm, as high as 3480 rpm.

Rugged, heat-treated, helical gear speed reducer.

Incorporates any STANDARD, CONSTANT-SPEED, FOOT-TYPE motor—capacities to 25 hp.

Self-compensating spring maintains correct spring tension—no adjustment.

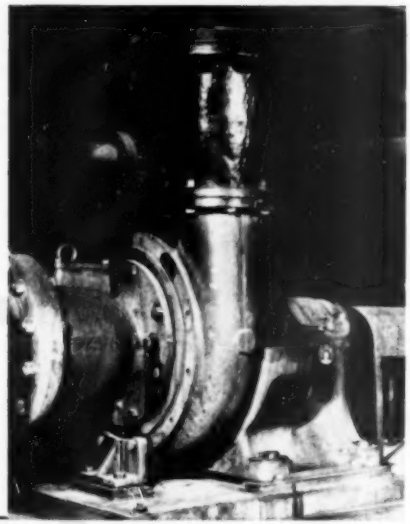
Reinforced V-belt provides maximum flexibility, strength, and wear-life; minimizes generation of heat.

Tested and proved REEVES speed-changing mechanism.

Manual, electric, or completely automatic mechanical or hydraulic control.

Compact design—vertical or horizontal—in many different assemblies.

Free-Machining ENDURO gives you–



THE CORROSION-RESISTANCE OF STAINLESS STEEL

Plus High Machinability

For every application in which you need top resistance to corrosion–plus the high MACHINABILITY necessary to apply this corrosion-resistance most economically–investigate Republic ENDURO Stainless Steel . . . in cold finished or hot rolled bars, and in wire.

Free-Machining ENDURO bars are cold finished by Republic's Union Drawn Steel Division to provide close tolerances, accuracy of section, uniform soundness and fine surface finish . . . plus the high physical and chemical properties of stainless steel. Two grades are fully 90% as machinable as Bessemer screw stock!

Republic metallurgists are ready now to give you prompt assistance on Free-Machining ENDURO Stainless Steel bar applications, processing and use. Contact them through your nearest Republic District Sales Office, or write:

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Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

doing the job. He should be constantly looking for new designs and ideas. Time should be found to read metal, engineering, industrial, and business magazines. In this way he can keep in touch with what the other fellow is doing, and how he is doing the job. This is the kind of foreman who is ready to step up the ladder.

A E Salmons
Philadelphia, Pa.

•

TRANSFER OR TAKEOVER?

Is a man ever so indispensable to a foreman that the shop team breaks down if the man is transferred to a higher job? Should a good assistant be retained for emergencies, or allowed to move ahead, even if it means shifting to another department?

In reduction of costs, regardless of the source, it has been found that a fair, well-organized incentive promotion plan will result in cost savings through increasing the productive efficiency of workers. As a means of developing cost reduction and increasing efficiency, management should encourage the ambitions of its men by providing the incentive of adequate opportunity for advancement.

Good management follows the policy of promoting from within and making available the instruction and training to make such promotion possible. In line with this promotion incentive, management should make sure every executive has a competent understudy. This understudy should be ready to take over in the event the opportunity arises necessitating a change of assignment for the executive.

However, in the case under discussion, I believe that the understudy should not be held in reserve to eventually take over the foreman's job when, and if, the occasion arises, but should be permitted to transfer momentarily to a higher position in another department. This arrangement would be more equitable for both the assistant and the organization, although not agreeable to the present supervisor who trained him as an understudy for his position. It is an indication of good foremanship when the supervisor can see far enough ahead to relinquish a capable assistant to another department. That kind of judgment is the sign of a good executive who has the best interests of management at heart.

Workers will talk enthusiastically of their foreman as a good man to

STEP UP PRODUCTION
with
PRESS-RITE
OPEN BACK—INCLINABLE
POWER PRESSES

Visit our Booth #1467 National Metal Show, October 20-24, Philadelphia, Pa.

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PRESS-RITE Power Presses are crammed with features which give you more day-in, day-out production . . . per machine . . . per operator . . . per dollar invested.

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Nos. 60 and 85 Also Available in Back-Geared Types.

Beat competition to the punch! Plan now to modernize your operations with Press-Rite Power Presses. *Write today for New Press-Rite Bulletin P-552!*

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PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS
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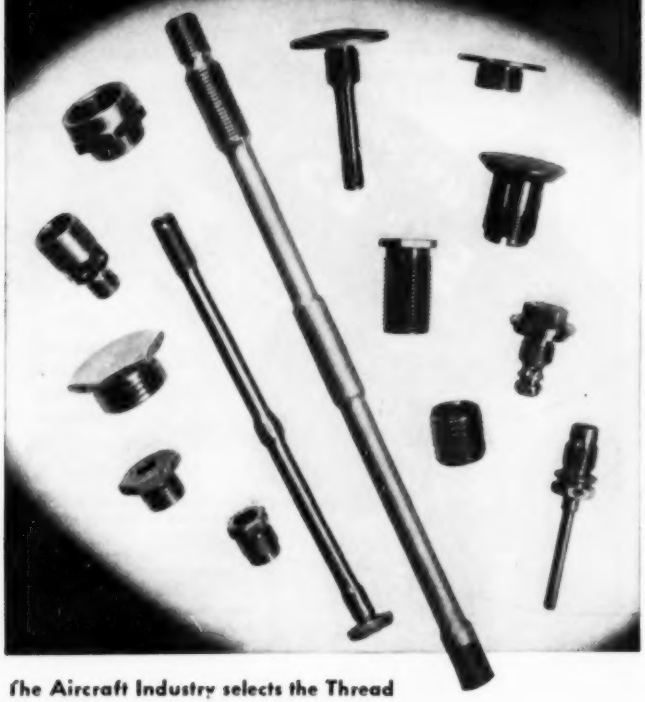
Rolling Precision Aircraft Parts on REED Cylindrical Die Thread Rollers



The Aircraft Industry selects the Thread Rolling Process as the preferred method of threading aircraft parts.

Thread rolling reproduces the precision thread form of the thread rolling dies and maintains the original accuracy of the setup over long runs.

The cold forging action of thread rolling produces a thread that is substantially stronger and tougher than similar threads produced by other processes.

Send us specifications of your requirements and let us supply you with complete information.

REED ROLLED THREAD DIE CO.

THREAD ROLLING MACHINES and DIES • THREAD ROLLING ATTACHMENTS, THREAD ROLLS, and KNURLS for AUTOMATIC SCREW MACHINES and TURRET LATHES

Worcester 1, Massachusetts, U. S. A.

AM-023

work for when there is evidence that he acts in their best interests. If you were to try to find out what makes a worker loyal and conscientious, the answers may vary, but almost always they include something close to the comment I heard about one foreman: "He's right in there pitching for us." Loyalty begets loyalty.

If you want to test the caliber of a foreman, ask him this frank question: "Suppose that you learn there is an opening in another department for a better job that your best man could fill. Would you recommend him?" Of course the foreman will have to wrestle with his conscience to come up with a good answer. At first thought he might say: "No, I'd keep him. That may be selfish, but why lose your best man after spending years training him?"

The far-sighted, thoughtful foreman will voice dissent with this contention. He would recommend the transfer of his able assistant for these reasons: First, although he would be losing a good man, everyone else on his staff would work harder to show their abilities, because they would see that the way is open for promotion. Second, the foreman would be improving his own chances of being promoted to a top management job by demonstrating he was thinking of the whole company's welfare and not just that of his own department. Of course, some foreman might feel that he had better promote the top-notch assistant out of his department before he steals his own job.

It is believed that those who are being trained for more responsible positions should be rotated in jobs in order to make them more flexible

"No, the union meeting broke up peacefully enough. But my wife had something to say because I didn't go straight home afterward."

PRESENTING THE AIR-OPERATED

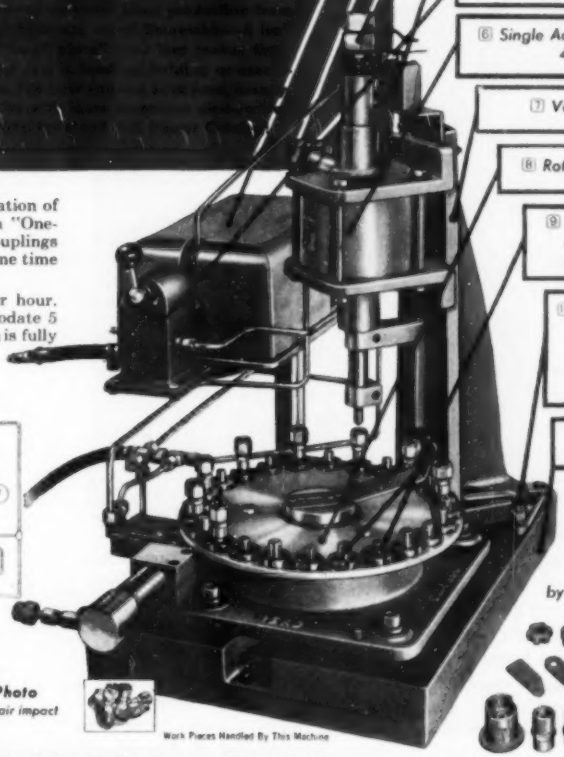
ROTARY WORK FEEDER

IN ACTION!

T

A simple and inexpensive combination of Mead pneumatic devices makes a "One-Man Factory" to assemble brass couplings by flaring neck into nut, at the same time forming a fluid-tight seat.

Output approximately 2500 per hour. Two sets of 12 mandrels accommodate 5 different styles and sizes. Operation is fully automatic except for loading.



[1] Model 2 Meadmatic Timer

[2] #2 Quick Exhaust Valve to speed up return stroke

[3] Adjustable depth stop with spring return

[4] Cycle release valve (included with timer) to reverse cycle at end of down stroke

[5] 4-B Master Valve starts and stops entire system

[6] Single Acting Cylinder, 4" bore

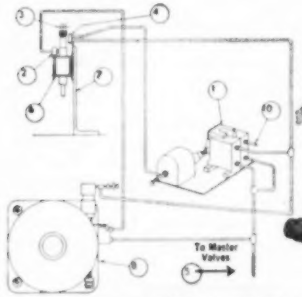
[7] Vertical Stand

[8] Rotary Work Feeder

[9] Alternate mandrels for two sizes of brass couplings

[10] Air blast ejection of finished parts, by jet piped from second of two valves in timer

[11] Universal Base



Circuit Diagram of Units in This Photo
Combine readily to feed work to drill press, air impact hammer for a wide variety of operations.

Work Pieces Handled By This Machine

Typica Work Pieces Handled
by Mead work feeders

MEAD SPECIALTIES COMPANY, Dept. MF-72, 4114 No. Knox Ave., Chicago 41, Ill.

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AIR OPERATED DEVICES

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Send free copy of new, colored MEAD INDUSTRIAL AIR POWER CATALOG describing the complete line of famous Mead air-operated devices.

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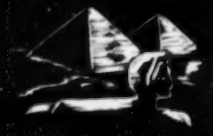
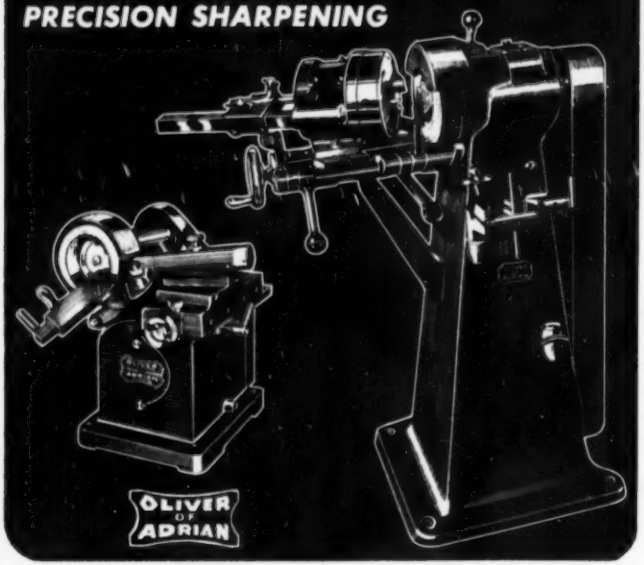
FAMED for PRECISION

The Great Pyramid of Gizeh Ranks as One of the Seven Wonders of the World



Built by unknown engineers thousands of years ago to cover the Tomb of the Pharaoh Cheops, it is believed that through the exactness of its orientation and the preciseness of its measurements, to have been built as an astronomical observatory or for recording geometrical facts. Modern scientists are still baffled by the precision of the techniques used in this ancient structure.

OLIVER DRILL POINTERS *ARE FAMED FOR PRECISION SHARPENING*



Production slowdowns are costly—frequently they are caused by improper grinding of the drill points. Don't be baffled by these costly delays—they can be eliminated with Oliver Drill Pointers which give balanced cut with each lip doing equal work. Prove to yourself as has been proved in thousands of toolrooms that machine grinding is the best and most accurate method for restoring efficiency to drills. Avoid excessive drill costs and imperfect holes by machine grinding on Oliver Drill Pointers. With the Oliver Method your drills will cut faster, last longer, and produce more accurate holes.

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances Variable point angles. Full automatic operation.

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet "How To Produce More Holes With Your Drills!"

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DOWELING MACHINES

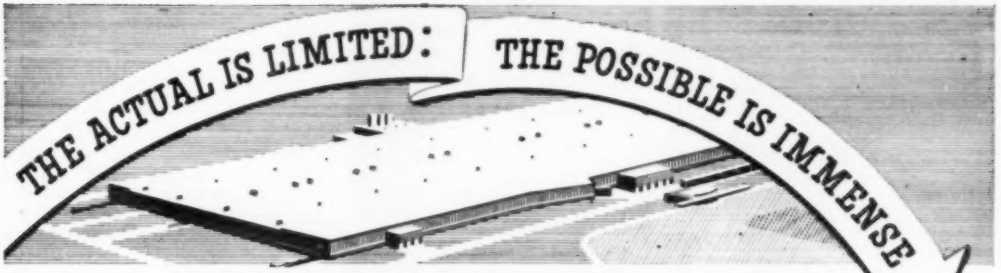
and adaptable, thereby avoiding crippling the organization when expansions occur. Having the understudy transferred to another department will not only benefit the organization in having a more versatile employee, but will indicate to the man that management is helping him make progress and get ahead. Giving the assistant an immediate opportunity as supervisor in another department will be placing emphasis on leadership ability as well as trade ability.

There is a great deal of merit in having potential supervisors become familiar with other departments of the company than the ones in which they are serving as understudies. Inasmuch as a good supervisor should have a fairly complete picture of the way in which the entire plant operates in addition to a thorough knowledge of his own department, the foreman candidate should clearly understand the relationship of the department he will supervise to all other departments in the plant. Transfer to another department will give the potential supervisor an insight into his relationship with other groups.

It may be hard medicine for the foreman to swallow in having to relinquish his topnotch assistant to another department, but learning not to play with the spoon before he takes the medicine is one of the attributes of a capable leader. Putting off an easy thing makes it hard, and putting off a hard one may make it impossible.

Next to knowing when to seize an opportunity, the most important thing in life is to know when to forego an advantage. The advantage of having a topnotch assistant available is outweighed by the greater advantage to management of having

Watching the "old man" lay out his own "Flesh and Blood" who had an idea of spending his vacation in the shop.



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

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WELDED DESIGN INCREASES RIGIDITY WITHOUT INCREASING COST

By **Eric Hartmann,** Experimental Research Engineer
The Porter Cable Machine Co., Syracuse, New York

BY changing over the design of our belt platen support to welded steel construction, we have cut deflection over 90%. The former cast construction, (Fig. 1) would deflect from .017" to .020" under 400 pound table pressure. The present welded steel design deflects only .0015" to .002" ... 10% of its original value.

Since steel is 2½ times more rigid than gray iron, it was possible to develop a more efficient product design on the platen itself without changing the basic dimensions of the machine or without increasing costs. On machine tools like ours, rigidity is basically important as it directly affects ultimate accuracy and efficient operation of the equipment.

Fig. 3—Detail of Column *on Porter Cable BG-8 Grinder. Shows assembly of belt platen support governing the ultimate accuracy and efficiency of the machine.*

Inset: Rear view of welded steel platen. *Shows efficient use of steel to achieve maximum strength and rigidity per pound of metal.*

WELDED DESIGN ALWAYS SAVES STEEL AND LOWERS COST

Fig. 1—Former Design—*Belt platen support for grinder was originally a casting. Required machining operations to finish the front face and the mounting arms.*

Fig. 2—Present Design in Welded Steel—*Is simpler to fabricate than the original construction. Components are pre-machined prior to welded assembly to simplify manufacture.*

HERE'S HOW

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Quoted from an article* in TEXTILE WORLD by MICHAEL J. KOROSKYS, Ass't Prof., Wool Dept., Lowell Textile Institute

HOW CLARK EQUIPMENT SAVES $400 A WEEK

"The average savings of four large worsted mills that are using this (CLARK) equipment is $400.00 a week. Two men, with the truck and wool-handling device, have replaced an average of 12 men per shift in each plant. In one plant the team did what 14 men used to do . . . and the new method is improving quality as well as reducing cost.

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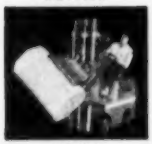

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that capable and potential supervisor actually filling an immediate and important vacancy.

Harry Kaufman
Philadelphia, Pa.

•

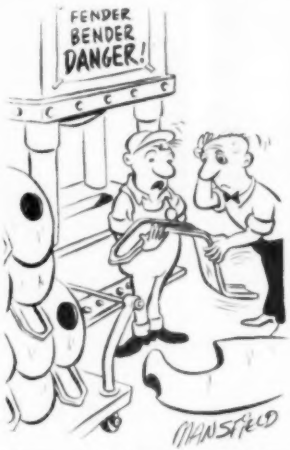
Ed's WORRY about Millikin getting a chance to advance seems entirely superfluous to me. If Ed is so narrow-minded that he won't wholeheartedly support this transfer, then he is unworthy of the cooperation of the working force under him.

I don't believe Ed's worry about his department is real, even if he says so. If his crew is a good team, it should be able to push ahead without Millikin. In any good working force, there are, as a rule, other men who can step in as replacements in case of emergency.

Why should Ed consider his team broken up just because a man is about to be transferred from his department? Perhaps it would be better, from the company's point of view, to transfer Ed! I don't think Reynolds wants to move Millikin to another department without a good reason; the reason may be to prevent him from moving to another employer. And I don't think Reynolds would make a move of this sort without consulting Ed.

If Ed is afraid of Millikin as a competitor for higher jobs, he should work all the harder to keep a high spot on Reynolds' list of good supervisors. Under no circumstances should Ed try to disparage Millikin to prevent him from advancing faster than himself.

How does Ed know that Millikin is going to store up a raft of headaches? Perhaps he'll prove himself



"I dunno . . . this happens every third drop!"

No MYSTERY

Clearing presses are much in evidence in the Kaiser-Frazer Shadywillow plant, opened some months ago in the Wheeling area. The one in the photo is part of a line of four Clearings forming a production group in the new plant.

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to be a good executive. I think Ed should wait and see before he puts himself up as a judge of the young man.

Whether or not a topnotch assistant should be held to take over, or farmed out temporarily to greener pastures, is a matter of circumstance. I think occasionally a good assistant is indispensable where he is, but under some conditions it is best to try him out on some independent proposition before he is further advanced. This should be fair to everyone concerned.

A E Fristedt
Stockholm-Bromma, Sweden

•

OUGHT NOT the criterion to be that which is in the best interest of the business? As the whole is greater than its parts, so is the well-being of a plant a more important consideration than that of a single department.

Neither Ed nor any other man can expect that the world or Millikin must stay put until his own particular fitness or otherwise has been proved, or wait until "something opens up above, or anything else happens." A firm that can fill its staff vacancies from its own ranks is to be congratulated.

Ed's thinking is too haphazard; there is too much Ed in it. To fill staff needs in this way must undoubtedly mean temporary loss departmentally, but in promoting the best man for the job, the whole business will gain, and, indirectly, individual departments.

Most men worth their salt like to work under a foreman whom they can respect and look up to. Like attracts like, and men like Millikin are a natural type for promotion. They must be released when opportunity offers, or they may seek new

"Well, was it hot in the shop today?"

pastures. The question is larger than that of the selfish retention of any one man or of blocking his future. The most desirable policy to follow places the best interest of the business first and personal considerations after.

P E James
Lincoln, England

•

IT IS EVERY man's right to be enterprising. Everyone wants a job with a ladder attached to it. They want steps in that ladder. The average employee doesn't want to be stuck in a dead-end or blind-alley job.

We must encourage each employee to learn all there is to know about the job and all related parts of the job. In the long run, the foreman will benefit by producing men capable of assuming leadership.

We all hate to lose key men, but we must always look at the whole objective. The wise foreman takes the time to consider what's good for the firm, as well as what's good for the department. The foreman who denies a promotion to others doesn't deserve it for himself.

A E Salmons
Philadelphia, Pa

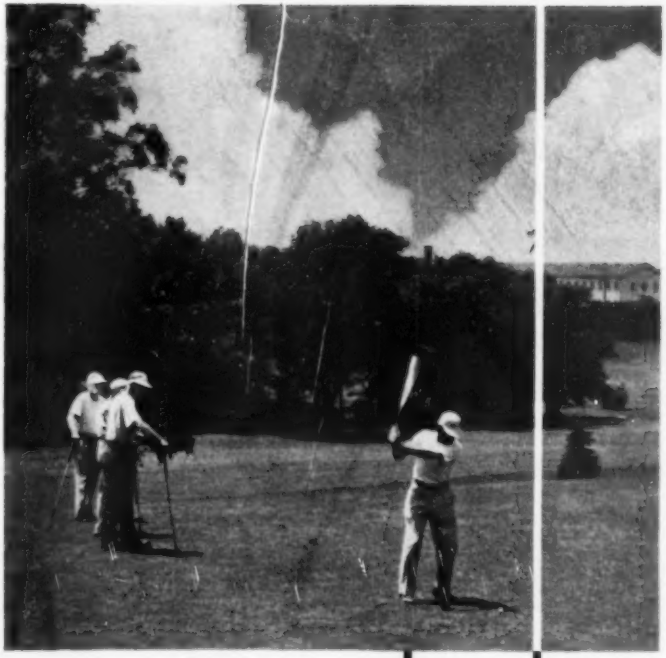
•

ALCOHOLICS FORALLEVUS

Is it possible to enforce a rule against daily use of alcohol by plant workers? Is it practical, particularly if a man's work is not affected by such use, and enforcement may result in the loss of a good worker? Readers think . . .

FOR THE LOVE of Mike, Al, are you one of these fellows who were born thirty years too soon? Just because a couple of finicky guys register a complaint about another having liquor on his breath is no reason why you should get hot under the collar. What's wrong about a fellow giving off a little alcoholic atmosphere? So long as he doesn't carry his bottle around with him or insist that you put up a brass rail to rest his foot on, you should be content to let the matter stand as it is.

The chances are that if you went into the head office right now you'd find old Bigshot himself pouring out a snort or two of his Kentucky's best. Take a peep at his bottom drawer — the right-hand side of his desk—and you'll find a fifth of Bee Juice, a bottle of seltzer water, a few glasses, pipe wrench, and other necessary items conducive to his peace-of-mind sessions — oh, and don't let me forget that goldplated



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corkscrew and can opener. Do you think that his secretary complains about his breath?

Al, you've got to be wide-minded about this liquor business; it's part of some people's lives to have a snort or two at various periods throughout the day. They have to have their little nip the same as you have to have your cup of tea. So long as a man turns out his work and attends to his own business, I see no reason why he isn't let alone to live his own life. Does the planer hand, whose national diet calls for a sprinkle of garlic in his food, smell like a freshly plucked gardenia? Compared with an atmosphere polluted with onion-tailed microbes I'll side up with Reynolds any day.

As the matter stands, Al, you're concerning yourself with something that's entirely none of your business. You're a foreman, not a reformer. You as a foreman have no right to interfere with a man's habits of living so long as your industrial needs are satisfied. You may have been brought up to feel that what Reynolds indulges in is decidedly wrong. Maybe it is, but who are we to judge? He no doubt feels the same way about you; he probably says to himself: "Poor guy; what a hell of a life to have to live—no fun—all work and no play."

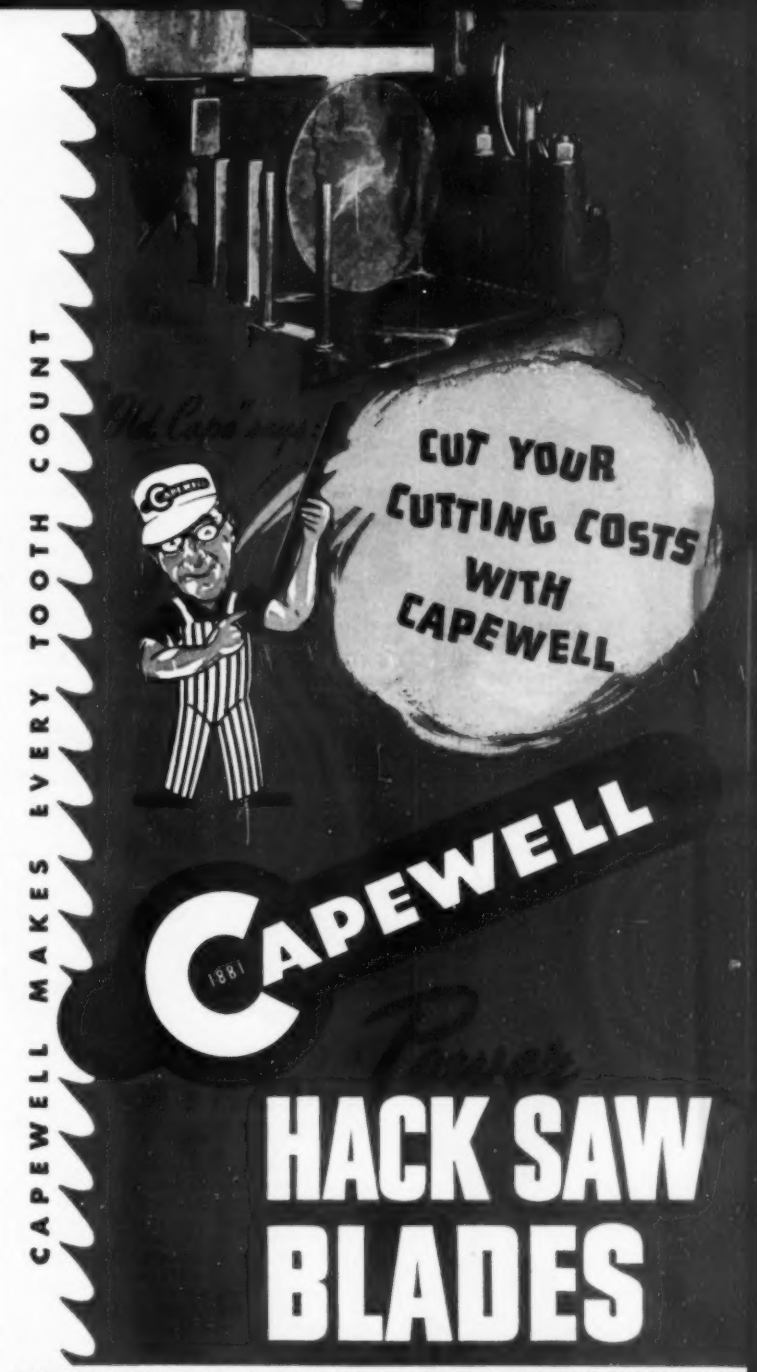
You've got to realize, Al, and your delicate-nostrilled friends, that this is an atomic age we're living in and some people have to have something stronger than apple cider in order to blow up their enthusiasm. If the shop needs air you can at least open the windows, or else install an air-conditioning system where the air is washed constantly. One caution, though—be sure to use copper piping!

Jack Everett
San Francisco, Calif.

•

FROM ALL ordinary standpoints, Al certainly has the right of this argument. Many companies spend a great deal of time, effort, and money in seeking to discover ways and means to reduce absenteeism, but it might be preferable to have certain fellows absent at certain times. Among these are fellows who show up with too much liquor under their belts, or who are definitely a social nuisance for any other avoidable reason. Garlic eaters and infrequent bathers are in the same class.

It is true that in some cases, men careless about such matters are nevertheless highly skilled. In such instances the value of the work they



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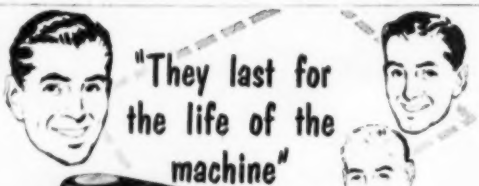

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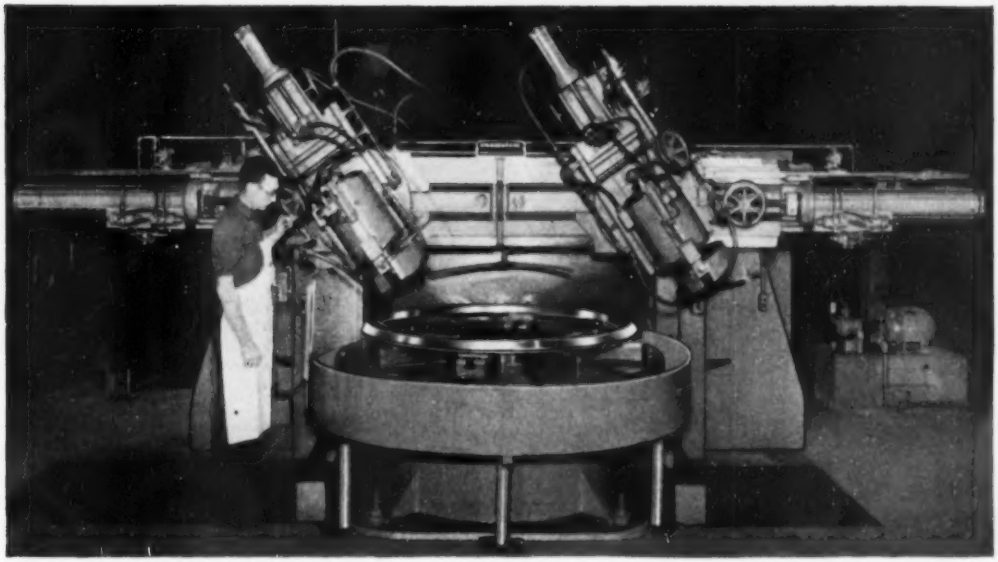
perform may in some degree outweigh the disadvantage of their nuisance value. It is undoubtedly true that such men do not realize how much of a nuisance they are, and some diplomatic way of advising them may bear worthwhile fruit. It seems only fair that a man should be given an opportunity to eliminate such shortcomings before his services are dispensed with for that reason. When the thing goes far enough that other men begin to complain, attention should certainly be given to it.

However, such matters should always be handled with extreme diplomacy. If the foreman is not enough of a diplomat to do the job without hurting feelings unnecessarily, it might perhaps be better to deal with the matter through the personnel office, having an unsigned letter of form type sent to such offending characters at their residence. This will let them know that complaints have been made, and will give them a chance to eliminate the offense without knowing whom they have to thank (?) for the issuance of the letter.

In reference to chronic alcoholism, however, there is a humanitarian viewpoint which should not be overlooked. There are various cases where a man gets into deep trouble, or at least into trouble that impresses him deeply with reference to his emotions. This may be family trouble, or it may be trouble of another sort. Such men often tend to become neurotic. It is a well-known fact that most chronic alcoholics become alcoholics as a result of being neurotic, drinking to drown their troubles, as it is so often expressed.

"I don't care if you were a waiter, use our regular handling equipment."



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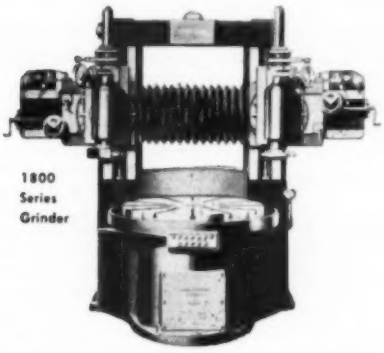

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2000	60" 72"	72" 88"
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The heartache is apparently assuaged to a degree while they are under influence of liquor. Therefore they return to liquor again and again, as a definite need in their neurotic setup. A good psychiatrist can often help such a man if he can get to the bottom of his trouble and show him how to handle it without resorting to alcohol as a deadening influence.

John E Hyler
Peoria, Ill.

•

OF THE MANY habits in which humans indulge, there is none which is more widespread and so hard to control as the habit of drinking alcoholic beverages, because the habit, once formed, is so hard to break or even to control to moderation.

During the many years of my machine shop experience many have lost their jobs by reason of its effects on turning out satisfactory quality of work as well as the person's unreliability in being at work on time and failure to report due to overindulgence in drink.

In shops where I have worked practically all those who have shown willingness to work have been located eventually where they were best fitted, but those found to be unreliable because of drinking have been eventually replaced.

The hardships that have been endured in families by the wives and children of drinking fathers and husbands have been most sorrowful in spite of much having been done in endeavors for reforming and sometimes needed aid for support.

Certainly the drink addict needs help, but I do not think it best for either the victim of drink or the management of a machine shop to employ him.

May the Lord help him to find aid through agencies much better qualified for such service.

H B Martin
Watervliet, NY

•

BLOWOFF

ANY TYPE of criticism is hard to take; the average man many times is hard put to accept it as it is usually given. Not always are the remarks passed to an individual with the intent to criticize. They may be harmless statements, general in nature, yet the fellow on the receiving end suddenly has a guilty feeling. Why? Because he knows that he is not doing his job the best he can. Perhaps he has known it for some time, but, as all of us tend to resist any change,

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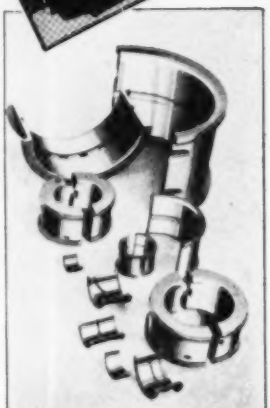

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Sleeve Type

he has just put off the day of reckoning when he would make himself a better man. Now suddenly a fellow-worker, or the boss, or even one of his own subordinate employees, makes a statement and he is filled with guilt. He reacts, not as a calm individual should, but rather as one trying desperately to save himself.

This problem of being criticized is not one that foremen alone face. People in all walks of life are constantly being placed "on the griddle." Much that is said is constructive and should be heeded. Maybe it is impossible to do all that would make you a better man in the eyes of your fellow-men, but never just brush aside a remark made to you in all seriousness. There always is some meat in it. Perhaps you feel that it is unjust, but stop to think . . . isn't there perhaps just a little truth in the criticism?

As individuals we all desire to be popular. We all want our fellow members of society to think well of us. Yet on the other hand, we just hate to change our own individualistic traits so as to conform with all the whims of the world. We must compromise, we must find out for ourselves just what is most important to us.

How then do we accomplish this? One thing is certain, we cannot let remarks rile up our system, no matter how close to home the statement may hit. Neither can we, if we are to be successful, just brush all these remarks aside. Therefore, listen to all the criticism. Try to understand the fellow making the remarks. What prompted them? Does he know what he is talking about, or is it a case of his just getting even for some personal and perhaps jealous reason?

Learn to know all your fellow workers. Learn to judge individuals

"But I haven't a thing to wear—"

accurately. It pays dividends. Now having listened to all the reasons why you are not making the grade, sort out in your own mind the most important factors and set about studying ways to overcome the most undesirable traits that you may have. Hard to do? Of course, but so is everything else. Why are we always seeking an easy way out?

Work at correcting your faults and see how much easier it is to accomplish your job. A foreman, if he is to become a true success, must constantly study himself. If subordinate criticism comes directly to him, he should be thankful—for at least he is not being knifed in the back. It could have been taken higher up and cost him his job. Better to have men working for you who try to aid you than to have those who are always ready to go around you and make trouble. Be sure that the workers use discretion in talking to you. Open wrangling is not conducive to harmony at home, in the office, or out in the shop. But listen and study and change . . . when necessary . . . and above all, don't think that *you are perfect* . . . for none of us is.

Charles D Townsend
West Hartford, Conn

•

NO MORTON or any other man working for me would call me a jackass or anything resembling one and get away with it. As an executive I am of the opinion that Al showed poor judgment in tolerating such and should have knocked the pins from under the guy and set him in his place. Morton's place in the shop is to do his work and not blow off steam anytime he feels inclined to.

Why a foreman should become confused when one of his men climbs his frame is a puzzle to me. It looks to me as though Morton saw Al push somebody off a bridge one dark night. Some bosses leave themselves wide open for anything short

"You hired me! He fired me! Let's get together around here!"

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STANDARD OR SPECIAL, FOR EVERY MACHINE TOOL AND INDUSTRIAL USE

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19651 JOHN R STREET
DETROIT 3, MICHIGAN

WRITE FOR CATALOG

of blackmail. Providing Al's conscience is clear, he should have gone to bat with the fellow and made him see who was the foreman in the shop and, that as the foreman, he be given the respect he is entitled to.

A foreman is not infallible; he has the privilege of changing his mind as often as he sees fit. No matter how good Morton's judgment is or how level-headed he is, there's a chuck hole on that plane somewhere as is evidenced by his tactless outburst.

Of course we can't blame the man if the forman has been careless in his conduct. He may—that is, the foreman—have confided too much in the man. Perchance he has lost some of the hard edge of his prestige by going on a bender or two and lost his sense of propriety while resting his tired foot on a brass rail. Loss of prestige is usually the price of executive relaxation.

When a man takes on a foremanship he does it with the understanding that he will be the one to give the orders. If he uses poor judgment and mingles with his men outside of the shop he can expect some of them to take advantage and prime him to the limit of his patience. If a foreman is going to have any efficiency in his department he has to command respect and the only way to do that is to conduct himself accordingly.

I don't consider a boss who puts up with being told off by one of his men as worthy of the position. Usually a man, who opens his mouth too wide, has one or all of the following characteristics: he's overimbued with his own importance; he's ignorant of

"Be wonderful to have a new road, but what's it going to do to our screw-machine department?"

ENGINEERS

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TO GET YOUR NEW PRODUCTION GOING AND KEEP IT GOING

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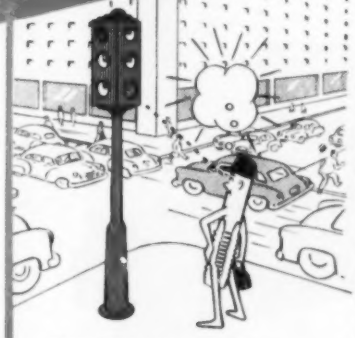
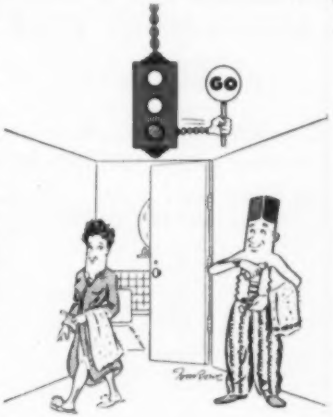
INQUIRIES PROMPTLY ANSWERED

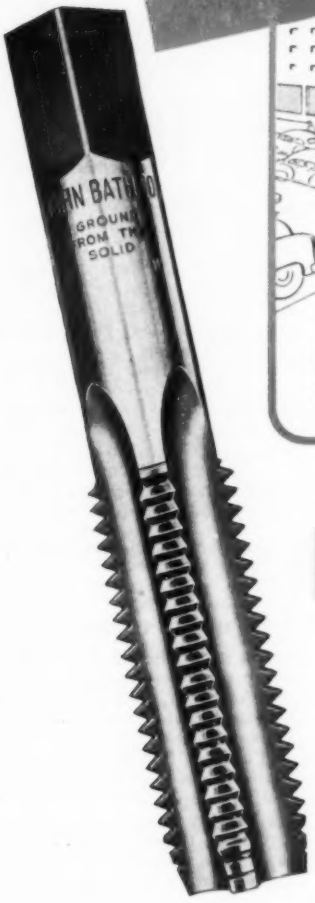
TAP-ODDITIES



Pete says — "a traffic signal
Gives everyone a break.
Each morning when I "gotta-go" —
What a difference it would make!"



Now, bathroom rush-hour traffic,
On schedule must behave.
Pete's daughter gets 3 minutes
And Pete . . . a chance to shave!



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Stay out of production "tie-ups" . . . keep your schedules "on the go" with BATH ground from the solid TAPS!

Of this you can be SURE . . . Bath Ground Thread Taps are made to give longer tap life — are accurately ground for high speed thread cutting efficiency and uniform performance.

Modern equipment is used for heat treating . . . for flute milling and grinding . . . for all steps of manufacture — to final 100% inspection. This constant check assures maintenance of BATH quality-control standards in factory procedure.

Perhaps BATH engineers can help give you the "green light" on some particular threading problem that is holding up your production speed and scheduled deliveries. The benefit of years of experience and research is yours for the asking.

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BRINKER MASCHINENFABRIK · HANNOVER

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MACHINING TIME BY 50%

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controlled by electronic valves permitting constant cutting speeds to be maintained.

■ CHECK THESE IMPORTANT ADVANTAGES

1 Longer service life of the carbide tipped tool.

2 Outstanding quality of surface finish when turning stepped diameter as well as when facing.

3 Simplified operation — gear changing is dispensed with because of pre-selection of cutting speeds.

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The MULLER-BRINKER LATHE is made in 5 sizes

24" × 30" centers
24" × 40" centers
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24" × 80" centers
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the ethics of industrial relationship; or else he's a four-flusher who strives to hide his true value by shooting off his big mouth.

Jack Everett
San Francisco, Calif

•

No INDIVIDUAL should resent a just criticism of his conduct, providing the expression has been made privately and in a friendly way, as it was in the case under consideration.

A subordinate is sometimes in a position to see where errors are made that are not apparent to a superior officer. However, when such occurrences are noticed, they should be reported to the higher authority as promptly as possible in a careful and friendly way.

Such matters are of a very sensitive nature, but should not be neglected. At first thought it may seem out of place, but in the long run it will be proved satisfactory, as a grave situation may be averted by prompt correction.

In fact, whenever it becomes apparent that a procedure should be changed, the one noticing the situation should report the suggestion to the person involved in a sincere and friendly way, regardless of whether it necessitates going either up or down in the rank of authority.

Abel Blakeman
Watervliet, NY

•

MERIT INVENTORY

I HAVE ALWAYS kept a mental record of those who worked in the department of which I had charge, giving especial thought to those with outstanding talent. I feel that it is a part of every foreman's job in order to enable him to make a fitting selection when promotions in salary and positions are being considered.

Another matter of great importance when making changes, is selection of a temperament that will best fit the new position.

The value of a written record of employees would be greater when a change of foremen is made, as it would give the new foreman information that otherwise might take him quite a long time to gain. However, such record should be very carefully guarded; if it should be seen by the workers it might make trouble.

I would consider the card system of very doubtful value.

John Mark May
Watervliet, NY

NEW BOOKS

GRAPHIC AIDS IN ENGINEERING COMPUTATION—*By Randolph P Hoelscher, professor of general engineering drawing and department head, University of Illinois; Joseph Norman Arnold, associate professor of general engineering, Purdue University, and Stanley H Pierce, associate professor of general engineering drawing and assistant dean, College of Engineering, University of Illinois. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N Y. 197 pages. Price $4.50.*

This book includes chapters on the standard slide rules, the derivation of empirical equations from laboratory or field data, the construction of nomographs by geometric means and with determinants, the construction of special slide rules, the solution of problems by graphical differentiation, and advanced work on moveable-scale charts.

Nomography is presented from the basis of plane geometry, with details of actual construction amply illustrated. The book is designed for students who have completed analytical geometry. Problems are provided for each major chapter.

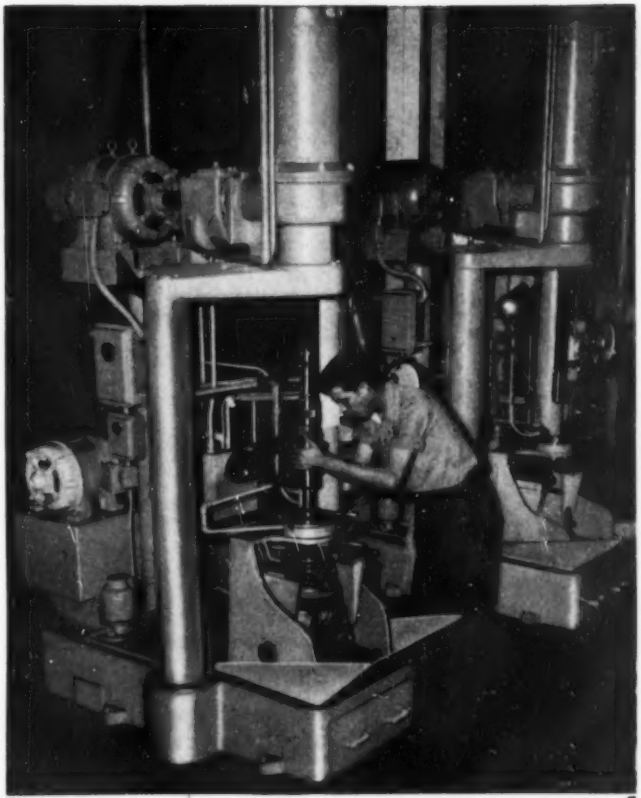
•

BASIC ENGINEERING THERMODYNAMICS—*By Vincent W Young, Consultant in Thermodynamics, formerly Professor of Mechanical Engineering at Oklahoma Agricultural & Mechanical College. Published by McGraw-Hill Book Co, Inc, 330 West 42nd St, New York 36, NY. 558 pages, 6 × 9 in. Price $6.50*

This book has been designed as the basis of a two-semester course in engineering thermodynamics but by less intensive coverage and the elimination of certain parts it may be used for a one-semester course.

In general, the treatment is such that the text is suitable for individual study, and the chapters not covered in class work may be used for reference during later specialized courses and more advanced study. Problems are included at the end of each chapter to help the student in his study of the subject.

Although the treatment is essentially conventional, certain features are new. These include the early



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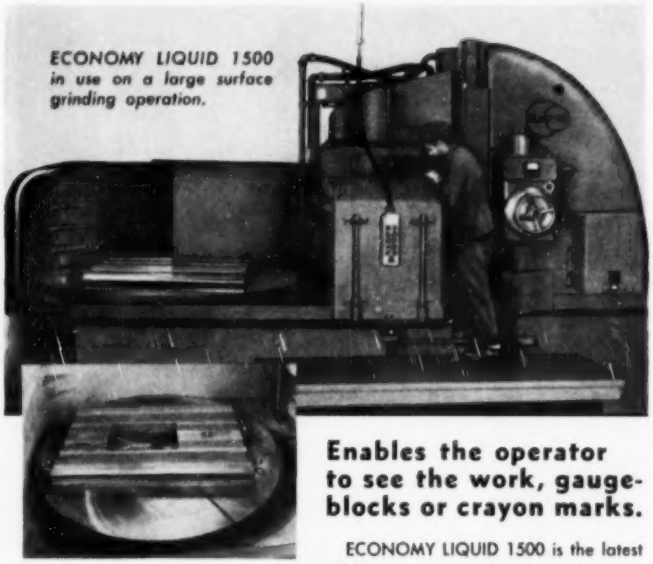
ECONOMY LIQUID 1500 ..the *Transparent* coolant for GRINDING



ECONOMY LIQUID 1500 in use on a large surface grinding operation.

The large piece set up on the 85" chuck, ready for grinding.

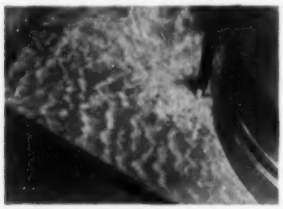


Photo shows actual grinding operation in progress. Operator can see the work, gauge blocks or crayon marks through the green, transparent coolant.

Enables the operator to see the work, gauge-blocks or crayon marks.

ECONOMY LIQUID 1500 is the latest addition to a complete line of metal-working lubricants in which The White & Bagley Company has specialized since 1888. Exhaustive tests prove that this *transparent* coolant used in a ratio of one part to 150-200 parts of water results in:

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- **Extremely rapid chip settling**
- **Clean machines**
- **A non-irritating coolant**
- **Excellent rust protection**
- **Practically no foam**
- **A long-lasting "sweet" solution**

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THE WHITE & BAGLEY COMPANY
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Originators of Grinding Lubricants

identification of the reversible process as a maximum-work operation and the use of the maximum-work concept in the development of thermodynamic theory throughout the book.

This book lays the groundwork in thermodynamics for all topics normally of importance in undergraduate training. The subject of heat transfer, closely related to thermodynamics though not always included in texts of this nature, is also treated. Those applications of thermodynamics to chemistry which are of chief interest to the engineer are discussed as well.

•

WAS DER MANN AUS DER SCHIEDE VON SEINER ARBEIT WISSEN MUSS *(What the Man in the Forge Shop Must Know About His work)—By A Schwartz. Published by Stahleisen, Düsseldorf, Germany. 126 pages. Price 7.20 German Marks.*

This is an intensely practical book, which covers almost all of the operations that are performed in a forge shop. Each operation is illustrated by one or more sketches. The author not only knows forge practice, but is also an accomplished artist. His sketches are so clear that the text can almost be dispensed with. Many excellent hints are given on labor saving and money saving. There are so many of them that they cannot be enumerated in a review.

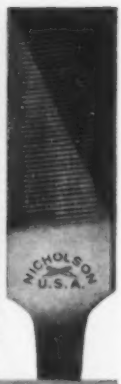
The book deals not only with the forging operations proper, but also with furnace practice, with crane operation, and with health and safety.

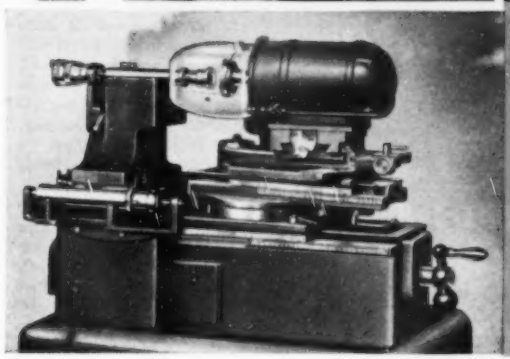
Schwartz's book is based on forge operations in a steel plant in Western Germany. It does not deal with mass production of die-forgings under hammers and in forging machines. In this respect it differs from the *Forging Handbook* by Naujoks and Fabel. The German book appears to be of greatest value in the field of apprentice education.—*W Trinks*

•

SAE AUTOMOTIVE DRAFTING STANDARDS—*Loose-leaf, punched sections. Published by the Society of Automotive Engineers, 29 West 39th St, New York 18, NY. Price, $5.*

These standards, for use in industry, schools and colleges, were developed to promote uniformity in rendering of automative drawings. Some of the subjects covered are drawing forms, lettering, projection, dimensioning,





REMOVING BURS (above) from brass lens-coating plate. The right file for use on this ductile metal is the Nicholson Brass File (illustrated). Its short upcut angle prevents file from running off the work. Its long overcut produces many tooth points on the upcut to break up filings; also allows file to clear itself of chips.

LATHE FILING (upper left) cast-iron housing part of Micro-Surfacer. The right file for smoothing work spun on a lathe is the Nicholson Long Angle Lathe File (illustrated). Long angle of its single-cut teeth slides chips down and out, minimizing chances of filling up and of scratching metal being filed.

American Optical SPEEDS PRODUCTION

with "The right file for the job"

In the American Optical Company's recently developed Universal Micro-Surfacer (*illustrated*), startling new heights of accuracy and speed are attainable in the production of prescription optical lenses.

Properly shaped, accurately cut, uniformly hardened Regular and Special Purpose files are necessary for many of the hand finishing and fitting operations involved in its construction and that of other American Optical products. The Nicholson policy of *Twelve perfect files in every dozen* was undoubtedly an important factor in the selection of file brands. The files you see pictured in action are NICHOLSON.

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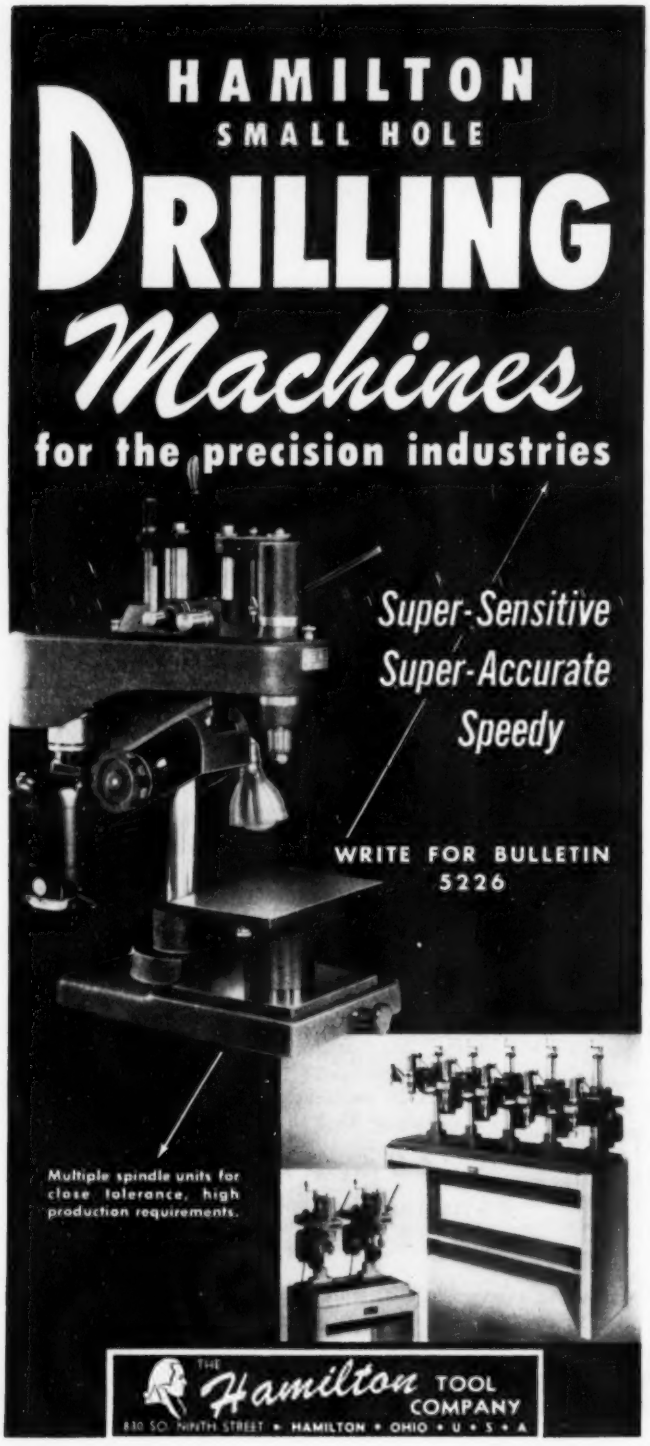


limits and tolerances, checking practice, etc. Materials like castings, stampings, forgings, plastics and powder metallurgy are discussed. Gears and splines, surface finish and springs are covered in some detail. Much other information is related to body detailing and mechanisms.

•

THE NATIONAL APPRENTICESHIP PROGRAM—*Published by the Bureau of Apprenticeship, Dep't of Labor, Washington, DC. 30 pages.*

What apprenticeship is, how apprenticeship programs are established, occupations in which apprentice training is given, and how the Bureau of Apprenticeship fits into the picture, are all explained in nontechnical language in this latest edition. It gives the answers to most of the questions received by the Bureau from employer and employee groups, as well as from parents, teachers, and employment offices.

Copies are available without charge from the Publications Branch, Bureau of Apprenticeship, US Dep't of Labor, Washington 25, DC, and should be in the hands of everyone concerned with the training of youth for the development of skilled tradesmen.

•

NOMOGRAPHY AND EMPIRICAL EQUATIONS—*By Lee H Johnson, Tulane University. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, N Y, and the Technology Press, The Massachusetts Institute of Technology, 174 pages, 7⅞ by 9¾ in. Price $3.75.*

Nomographs and empirical equations provide two useful techniques for handling experimental and operational data—both in finding the correct answers and in interpreting them. The author uses a simple and direct approach; the treatment of nomographs, for example, is based on plane geometry and logarithms.

Introduced for the first time is a method of analyzing an equation and its variables before plotting a nomograph in order to find the best arrangement of scales. The effect of scale arrangement on the accuracy of the nomograph is also discussed.

The problems given for the student to solve are practical ones, taken from science and industry.

Topics covered include: parallel-scale nomographs, Z-charts, parallel and perpindicular index lines, concurrent scales, recurrent variables,

combined nomographs, methods of curve fitting, curves of two constants, curves of three constants, and curves of four constants.

•

CORROSION RESISTANCE OF TIN AND TIN ALLOYS—*By S C Britton. Published by Tin Research Institute, Inc, 492 W 6th Ave, Columbus 1, Ohio. 77 pages. Price $0.50.*

Because more than half the tin used in the world is employed as a protective coating to prevent corrosion, this book has been prepared to deal with this factor exclusively. The first section considers the corrosion of tin itself by indoor and outdoor atmospheres, by acids and alkalis, and by milk and other materials.

Part 2 deals with the various alloys of tin, including solder, bearing metals, and bronzes. The third section is concerned with tin and tin-alloy coatings. A brief description is given of the methods by which these are applied, and experiences are quoted concerning tinned steel containers for food. Tin alloys, including tin-lead-zinc, tin-cadmium, tin-copper, and tin-nickel electroplate, are discussed in detail.

•

HEALTH RESOURCES IN THE UNITED STATES:—*By George W Bachman and Associates. Published by The Brookings Institution, 722 Jackson Place, Washington 6, D.C. 344 pages. Price $5.*

This study of the nation's health services draws upon materials from more than 700 public and private agencies, including surveys compiled especially for this project.

The chapter devoted to health services in industry is based on two surveys, one covering 3,589 member companies of the National Association of Manufacturers included more than 3 million workers, the other covering 569 plants with industrial-health programs approved by the American College of Surgeons included 1.7 million workers.

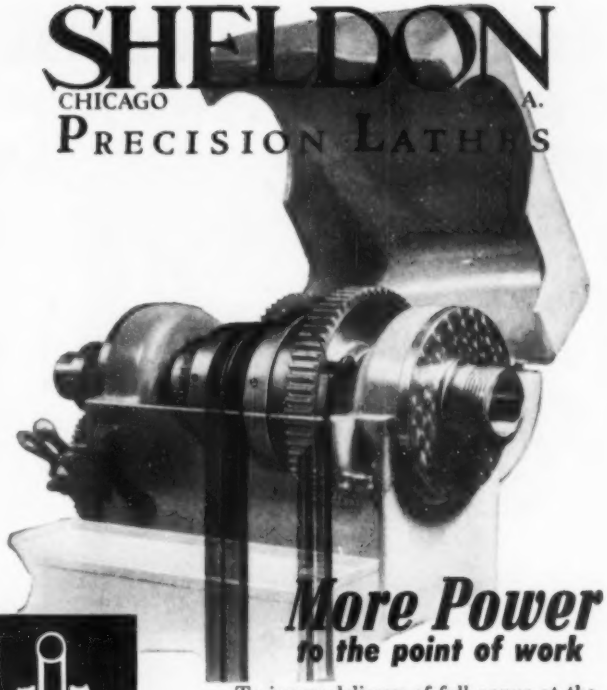
Dispensary visits by workers averaged 7.8 per worker in 1949. Of these 4.1 visits were related to occupational causes and 3.7 were non-occupational. Cost of health, medical, and safety programs averaged $25.90 per employee. This figure is felt to be low because many companies reported direct costs only.

The book provides a useful factual source for those working with either the medical or economic aspects of health services.

SHELDON

CHICAGO A.

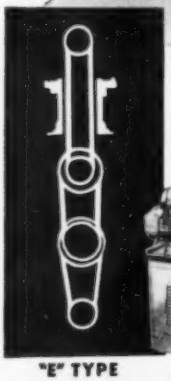
PRECISION LATHES



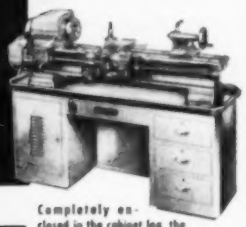
More Power
to the point of work

To insure delivery of full power at the point of work . . . to prevent slippage on heavy cuts, the underneath motor drives of SHELDON Precision Lathes have double V-Belts driving the spindle. Tandem V-Belts, each of which engages the spindle around a full 50% of its circumference.

You will note a feature of SHELDON underneath motor drives not common to other moderate priced lathes is the extra, underneath counter shaft that permits driving thru a *standard* 1-piece lathe bed. There is no cutting away of the bed for belt clearance, nor use of "spliced" beds, in SHELDON Precision Lathes.



"E" TYPE



Completely enclosed in the cabinet leg, the the SHELDON Type "E" Underneath Motor Drive has matching 4-step, V-Belt sheaves which provide 4 speeds (8 spindle speeds). All belts are provided with individual means for permanent adjustment of tension.

"U" TYPE

With a SHELDON Type "U" Underneath Motor Drive, all speed changes are instant—are made by clutches operated by levers that are conveniently located outside the enclosed cabinet leg. 4-speeds (8 spindle speeds) and individual belt tensioning means are provided.

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Tooling, consisting of shunt die and hydraulically operated guns can be readily modified for welding of other parts with consequent savings in capital expenditure and changeover time.

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NAMES in the NEWS

Samuel Sloan Auchincloss

Samuel Sloan Auchincloss has been named executive vice president of DeWalt Inc, Lancaster, Pa., subsidiary of American Machine & Foundry Co. Associated with the organization since 1946, Mr. Auchincloss has been serving as director of operations of AMF's Colorado Springs plant.

John R Gilmartin has been appointed general sales manager of the Hyatt Bearings Div, General Motors Corp. He succeeds **Howard K Porter,** who has been named assistant to the general manager on special assignment. Mr Gilmartin has been associated with the firm since 1929, most recently serving as assistant to the sales manager.

Delmar R Lammers has been appointed service manager to assist in general service administration at Caterpillar Tractor Co. **Merle W Dargel** succeeds Mr Lammers as eastern division service manager, and **Theodore M Fahnestock** takes over Mr Dargel's duties as service engineering manager.

Lyman L Campbell has been appointed chief development engineer, Liquid Carbonic Corp, Chicago. Prior to his association with the company, Mr Campbell was chief engineer of the Globe Co, Chicago.

Roland H Johnson, former sales manager of E W Bliss Co's can making machinery div, has rejoined the company in an executive capacity.

Leonard L Robb has been named to head sales of Alemite lubrication equipment and Stewart-Warner instruments. For eight years prior to his appointment as assistant to the president in 1950, he was production control manager of the division whose wholesale sales he now heads.

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FLUID DRIVE
3 to 8 times longer clutch life

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30% more strength against shock loads

SHOCKLESS STEER'NG
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AUTOMOTIVE-TYPE BRAKES
smoother, safer stops

ROLLER CARRIER UPRIGHTS
less friction and more efficiency

65-HP ENGINE
waterproofed and built for rugged, constant service

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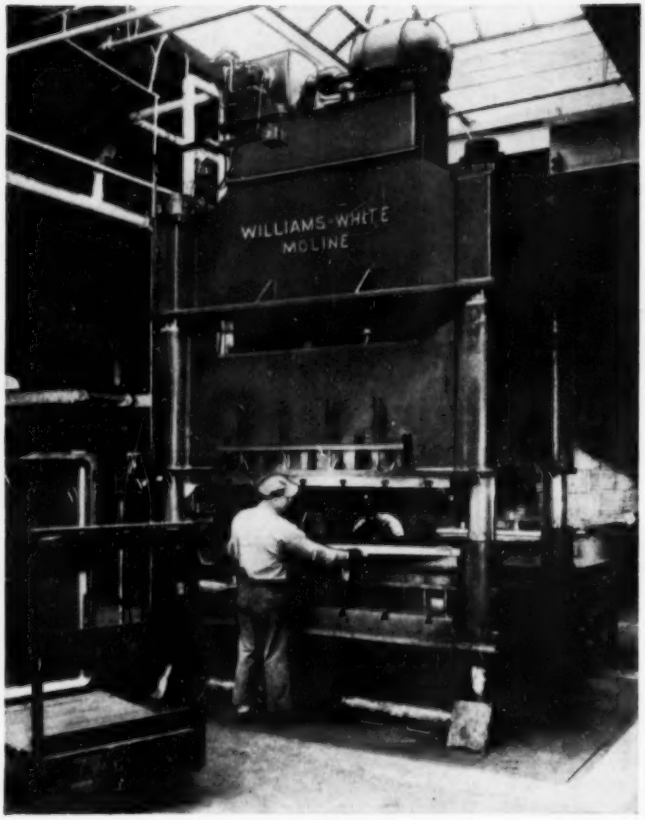
GAS AND ELECTRIC INDUSTRIAL TRUCKS • WORKSAVERS
HAND TRUCKS • HAND AND ELECTRIC HOISTS • PUL-LIFTS

Drawing Freezer Tops . . . on versatile 400-Ton WILLIAMS-WHITE Press



Drawing, blanking, forming . . . all can be done on this versatile 400-Ton Hydraulic Press, positively controlled by push buttons. This WILLIAMS-WHITE press has a double 150-Ton draw cushion and the bed size is 88" by 53". It is just one of many types and styles of presses built by WILLIAMS-WHITE & CO for the metal working trade.

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WILLIAMS-WHITE & CO.
MOLINE, ILLINOIS

Harry E Sloan, Jr, has been appointed president of Cushman Chuck Co, succeeding his father, **Harry E Sloan,** named chairman of the board. **Edward L Field** has been elected treasurer of the company. **William C Gaw,** former sales manager, has been elected vice president in charge of sales. **W Howard Spencer** has been named assistant treasurer, and **John L Way** has been appointed assistant secretary.

George L Simms

George L Simms has been appointed general manager of Reynolds Metals Co's McCook Sheet Mill, in Ill., and Reynolds Alloys Co, a subsidiary, at Listerhill, Ala. Mr Simms was formerly manager of the McCook plant. **Donald Hipp,** formerly manufacturing vice president, has been named vice president and manager of Reynolds Alloys facilities, succeeding the late **M A J Phillips. John E Larson,** formerly plant supt at McCook, is taking over Mr Simms' duties as plant manager.

William G Orr has been named manager of contract administration for AiResearch Mfg Co, Los Angeles. Mr Orr replaces **Harold L Lynch,** who has returned to his former position as executive assistant to the treasurer. **James V Crawford** has been appointed assistant chief engineer in charge of the heat transfer and cabin pressure dept. **Ray Jensen** has been promoted to the post of senior project engineer, and **Barney Maas** been named project engineer.

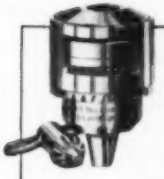
Allison R Maxwell, Jr, has been elected vice president, sales, of Pittsburgh Steel Co, and **Marvin J Bair** has been appointed general manager of sales. **Norman J Froelich,** assistant general manager of sales, has been given additional responsibilities, and **John C Cercone** has been named assistant general sales manager in charge of sheets and semi-finished products.

FIRST... *from any global viewpoint*

World's Most Widely Used Chuck is the Jacobs Plain Bearing Chuck, first choice the world over for light and medium duty drilling. Rugged construction, high-precision accuracy, and tremendous gripping power are the reasons why.

Jacobs Chucks are stocked and sold by your Industrial Supply Distributor.

The Jacobs Manufacturing Co., West Hartford 10, Conn.



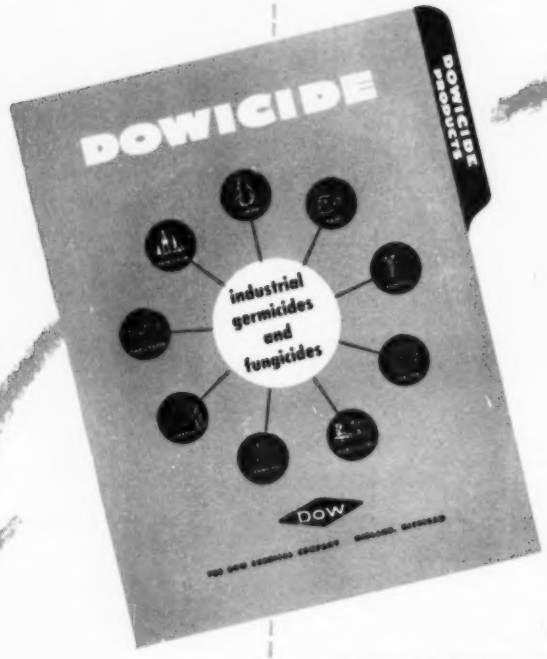
The Jacobs Ball Bearing Super Chuck, designed particularly for heavy duty drilling, has the most powerful grip ever developed in drill chuck history.

IF IT'S A

JACOBS

IT HOLDS

The Complete Story of Proved Protection against Mold and Bacterial Attacks!



FOR PROVED PROTECTION against MOLD and BACTERIA

mail this Coupon Today!

For the first time Dow offers you this easy-to-use, comprehensive file of information on Dowicide products . . . the time-tested industrial germicides and fungicides. The Dowicide product file tells how you can bring effective, economical microbial control into your plant. It assembles under one cover many suggested uses for Dowicide preservatives. In addition, it gives their formulas as well as their chemical and physical properties. Free your plant from costly attacks of mold and bacteria today. Send for your copy of the Dowicide product information file *without obligation.*

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

The Dow Chemical Company
Dowicide Division, Dept. DC1018, Midland, Michigan
Please send me the Dowicide Product Information File.

Name _____ Title _____

Company _____

Street _____

City _____ State _____

I am interested in using Dowicide Products for _____

Dow
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

E W Engle has been named product and process engineering manager of the Carboloy Dept of General Electric Co, Detroit. **E E George** has been appointed design and application engineering manager; **R A Canning,** production engineering manager, and **R L Brownlee,** administrative engineer.

Milton F Beecher

Milton F Beecher, head of Norton Co's research and development laboratories since 1941, has retired as vice president and director. Mr Beecher will be succeeded by **Wallace L Howe,** director of research and development.

Mead W Batchelor has been appointed president of the Riverside Metal Co, Riverside, NJ, succeeding **James T Duffy, Jr.**

Edward F Whittemore has been appointed purchasing agent for the Morse Chain Co's Detroit plant. Mr Whittemore was formerly associated with the New Holland Machine Co, where he directed purchasing of raw material, component parts, and supplies.

David Reid has been named supt of grain and bond plants at Norton Co, Worcester, Mass. Mr Reid was formerly assistant supt of organic products. **Roger J Dufresne,** formerly assistant foreman, resinoid department, has been appointed assistant to the supt of organic products.

Don Faulkner has been appointed a sales engineer for Hydro-Aire, Inc, Burbank, Calif.; he will represent the company in the San Francisco Bay area and the Pacific Northwest. Mr Faulkner was previously associated with Boeing, Seattle.

Frank R Dedrick, associated with the Bullard Co for the past 43 years, has been granted an extended leave of absence. **Joseph C Olson** will take over Mr Dedrick's duties as personnel manager.

STANDARD TOOL
ON SPECIAL JOB
Reduces TOOL COSTS 65%

Here's what happened during an inside threading operation at an atomic special project. A special carbide cutting tool was being used for the job, which requires a No. 10 Acme thread in steel S. A. E. 1030. Everything went wrong, however. Tools were breaking, and the result was not one piece was completed.

Mr. Howard G. Frisby, Jr., representative of Choctaw, Inc., Memphis, came to the rescue. He furnished a Wendt-Sonis standard AR style carbide tool bit, turned it up sideways and reground it on the job. Breakage was eliminated, the job finished and tool costs reduced 65%.

YOUR CHOICE OF CARBIDE

When you choose Wendt-Sonis, you select the brand and type of carbide you want. You also select from a complete range of Wendt-Sonis standard tool sizes. All Wendt-Sonis carbide-tipped tools have rust-resistant tool shanks made from highest quality steels for greater economy and faster production.

Free! CHIP BREAKER CHART

Contains illustrations of chip-breakers, grinding instructions and recommendations for their use. Chart size with tab for wall hanging. Write: WENDT-SONIS COMPANY, Hannibal Mo.

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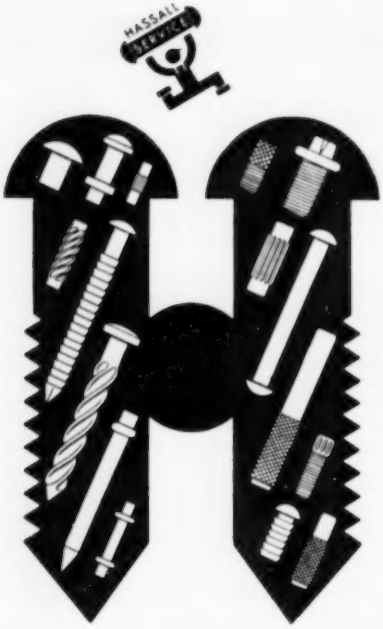
HANNIBAL, MISSOURI

580 N. Prairie Ave., Hawthorne, Calif.

549 West Randolph St., Chicago, Ill.

CARBIDE-TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL TOOLS



Special cold headed products

. . . nails • rivets • screws

. . . made to order

. . and to your specifications in any metal. Large raw material inventory for your convenience. Send drawing — advise quantity.

Free catalog on request.

Hassall
ESTABLISHED 1850

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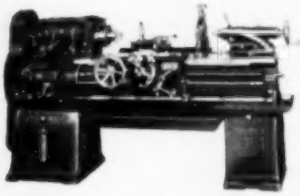
NOW! Even *Finer*

BRADFORD *Metalmaster* LATHES

12", 14", 16" (Rated Size) Engine & Toolroom Lathes



14½", 16½", 18½", actual swing

BRADFORD Metalmaster Geared Head Lathes have earned an enviable reputation through the years for high efficiency and dependable accuracy. But today's new Metalmaster is even finer. Precision-built of finest materials and components, these lathes are equipped with many outstanding features normally found only on the most expensive lathes.

Where greater power is required the Series "H" Metalmaster is recommended as a 7½ h.p. motor can be used on the 12" and 14" lathe and a 7½ or 10 h.p. on the 16" lathe. Same general design as regular model.

Before you make a lathe investment, investigate the new Metalmaster. Write for Bulletin No. 179.

STANDARD EQUIPMENT FOR METALMASTER LATHES

- 12 Speed Timken Geared Head
- Quick Change Gear Device
- Double Wall Apron
- Tailstock • Compound Rest
- Steady Rest
- Face Plate
- Dog Plate
- Head Center Bushing Shear Wipers
- Chasing Dial (Not furnished on Metric Lathes)
- 2 Centers
- Wrenches
- Motor Mounting and Wiring
- Push Button Starter
- Vee Belt Drive
- Automatic Lubrication in Head
- Cabinet Legs
- Lever Control for Length and Cross Feeds
- Mechanical Apron Clutch Control
- L-1 Taper Nose Spindle
- A Complete Line Accessories

NOTE:
14" Lathe Available For November Delivery on Unrated Orders, Subject to prior sale.

THE BRADFORD MACHINE TOOL CO.
644 EVANS STREET CINCINNATI, O.

Precision Since 1840

Robert L Clark, formerly assistant production manager for Ryan Aeronautical Co, San Diego, Calif., has been appointed director of the newly-established methods engineering division. Mr Clark will be assisted by **J R Ferguson**, in charge of facilities planning, and **Sam R Kroschel**, project control and time study.

Leslie M Case has been appointed director of the Mining Machinery Div, Industrial and Agricultural Equipment Bureau, National Production Authority. Mr Case, deputy director since June 1951, succeeds **Harold Montag**, who has returned to the executive staff of the Joy Mfg Co, Pittsburgh.

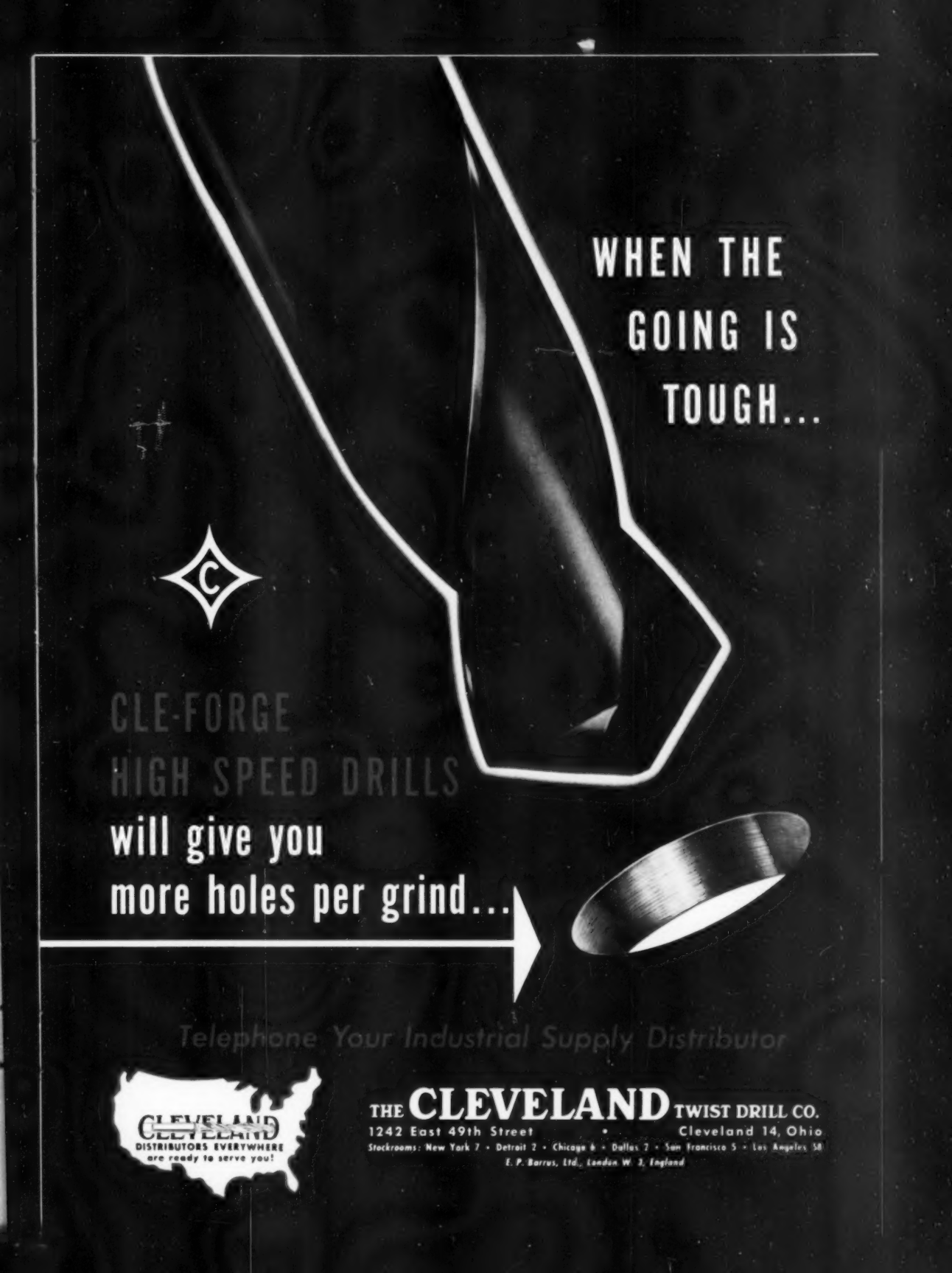
Fred D Martin has been appointed plant manager of the St Mary's, Pa., manufacturing facilities of Speer Carbon Co. Associated with the organization since 1935, Mr Martin was formerly assistant plant manager in charge of plants 1, 2, and 4.

R W Davis has retired as special representative at the Allis-Chalmers Norwood, Ohio, plant. Mr Davis has served in various capacities since joining the firm in 1908. During World War II, he was director of the electrical equipment branch in the War Production Board for two years.

James D Young

James D Young has been appointed general sales manager of the Stamford Div, Yale & Towne Mfg Co; he succeeds **A Charles Amann**, who has resigned. Mr Young, who has been a member of the firm since 1941, will direct all sales operations for locks and builders' hardware products.

Malcolm Roberts has joined the sales force of Kurt Orban Co, machine tool division. Mr Roberts has been sales engineer for the New Britain Machine Co in the Cleveland area for the past ten years.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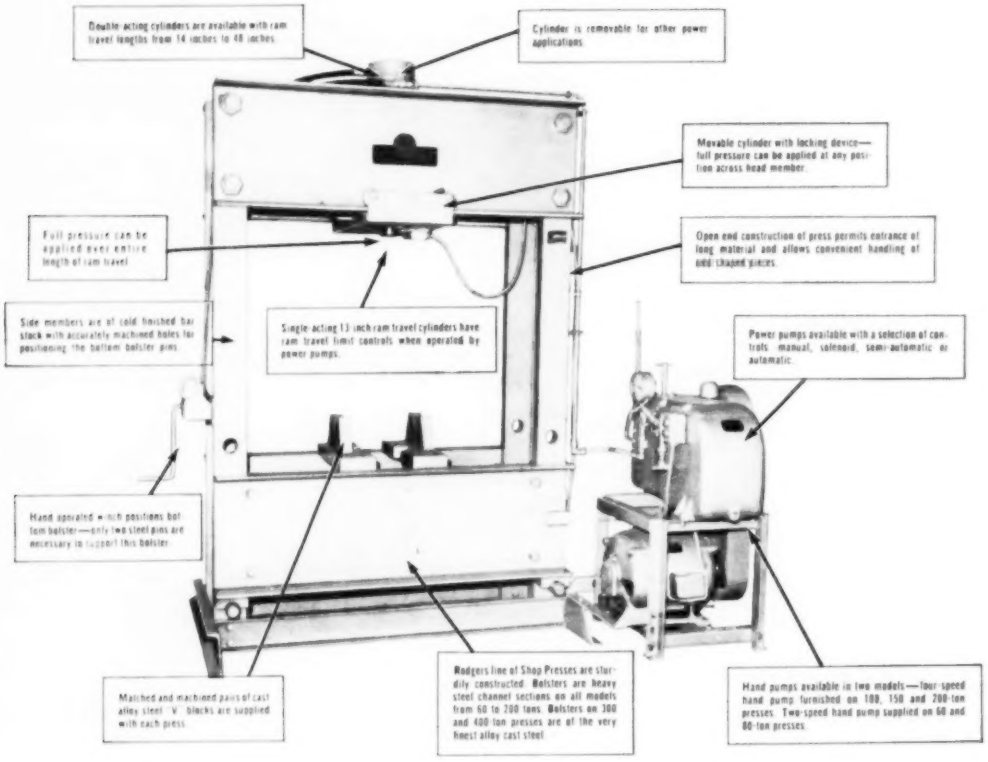
GOING IS
TOUGH...
CLE-FORGE
HIGH SPEED DRILLS
will give you
more holes per grind...
Telephone Your Industrial Supply Distributor
CLEVELAND
DISTRIBUTORS EVERYWHERE
are ready to serve you!
THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 2, England

No other shop presses

GIVE YOU ALL THESE PERFORMANCE FEATURES!


Double acting cylinders are available with ram travel lengths from 14 inches to 48 inches.
Cylinder is removable for other power applications.
Movable cylinder with locking device—full pressure can be applied at any position across head member.
Full pressure can be applied over entire length of ram travel.
Open end construction of press permits entrance of long material and allows convenient handling of odd shaped pieces.
Side members are of cold finished bar stock with accurately machined holes for positioning the bottom bolster pins.
Single acting 13 inch ram travel cylinders have ram travel limit controls when operated by power pumps.
Power pumps available with a selection of controls: manual, solenoid, semi-automatic or automatic.
Hand operated with positions bottom bolster—only two steel pins are necessary to support this bolster.
Matched and machined pairs of cast alloy steel "V" blocks are supplied with each press.
Rodgers line of Shop Presses are sturdily constructed. Bolsters are heavy steel channel sections on all models from 60 to 200 tons. Bolsters on 300 and 400 ton presses are of the very finest alloy cast steel.
Hand pumps available in two models—four-speed hand pump furnished on 100, 150 and 200-ton presses. Two-speed hand pump supplied on 60 and 80-ton presses.

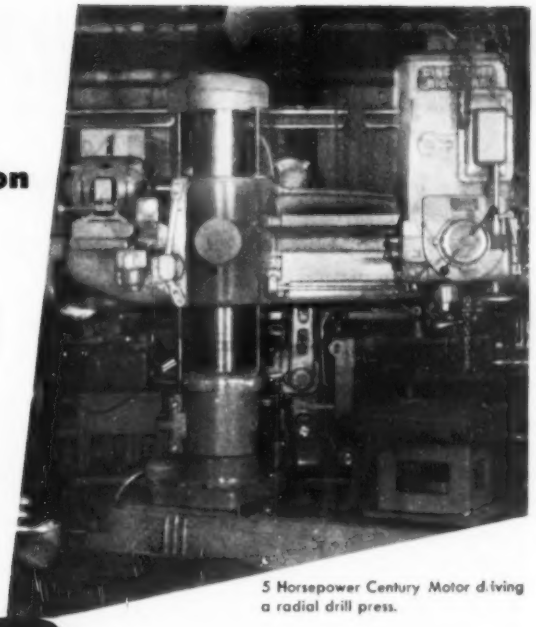
Although you can't see performance by looking at a press, you can see the features which make outstanding performance possible. That's why we illustrate here, a few of the many features incorporated in Rodgers Hydraulic Shop Presses. They are an exclusive combination of features that insure top performance, high efficiency and long, trouble-free service. Many other important features of Rodgers Shop Presses are shown in the new illustrated Catalog No. 313A. Write today for your free copy and then compare—point for point—feature for feature.

HYDRAULICS KEEP THE WORLD MOVING

Rodgers Hydraulic, Inc.

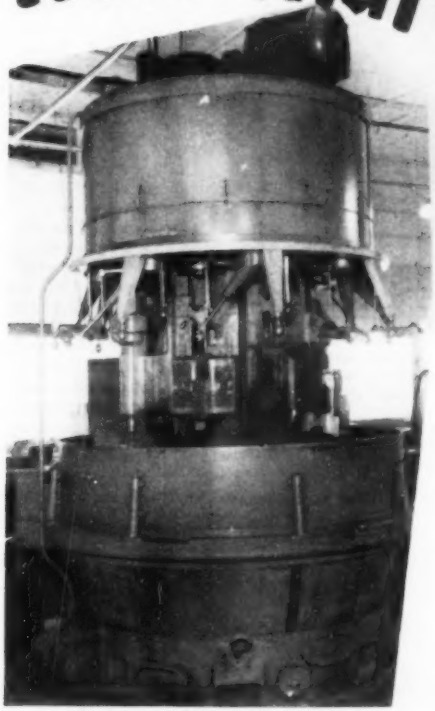
7407 Walker St., St. Louis Park, Minneapolis 16, Minn. HYDRAULIC POWER EQUIPMENT

On Your Production Machines . . .



5 Horsepower Century Motor driving a radial drill press.

Hold That Precision Line



25 Horsepower Century Motor on a Bullard Automatic.

With

Century Motors . . .

Widely Known for Their Unusual Freedom From Vibration

Century motors supplement the precision of fine equipment . . . resulting in closer tolerance of the product produced by the equipment.

The unusual freedom from vibration in Century motors is contributed by: Accurate concentric machining to provide a uniform magnetic airgap between the rotor and stator . . . Balanced electrical design . . . careful dynamic rotor balancing . . . accurately machined mounting surfaces.

Century offers a most complete line of types and sizes from ⅛ to 400 horsepower.

Specify Century motors on your original equipment. Call a Century branch office or a Century Distributor for your motor requirements.

Century C MOTORS

CENTURY ELECTRIC COMPANY
1806 Pine Street
St. Louis 3, Missouri

CE 753

DECKEL UNIVERSAL PANTOGRAPH DIE SINKERS

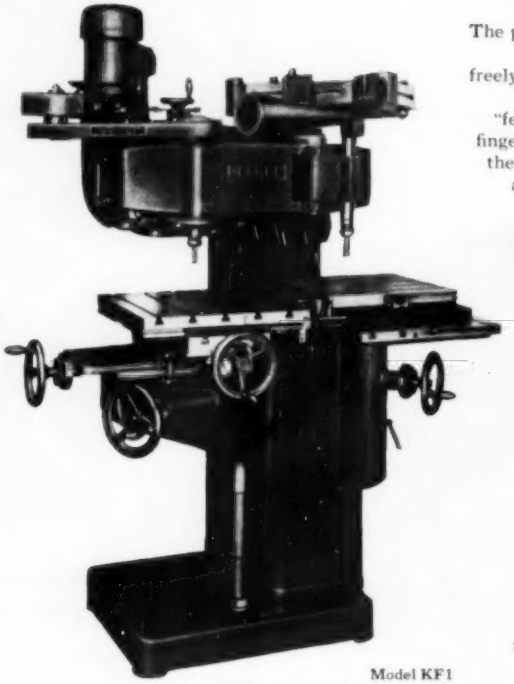
for Greater Economy in Producing Dies and Molds up to 1100 lbs.

LATITUDE

The pantograph system permits two and three dimensional milling at 1:1 ratio and reductions or enlargements from 1:1.5 to 1:4. The machine is converted to a plain Vertical Miller by simply locking spindle head.

GREATER ECONOMY

Masters or patterns of geometrically defined shapes can be made from sample parts or drawings. Dies are produced in a single set-up by using either the incremental horizontal feed or the automatic depth feed method. This eliminates extensive hand finishing operations.



Model KF1
Universal Pantograph Die Sinker
with optical contacting device for rough milling.

GREATER ACCURACY

The parallel guiding mechanism and the pantograph move freely on roller and ball bearings. This provides the delicate "feel" of the cutter action and finger-tip control, that produces the high dimensional accuracy and excellent surface finish.

VERSATILITY

The usefulness of the KF1 for machining at a 1:1 ratio, is broadened by the many accessories available: Rough Milling Spindle holds cutters up to 1½" diameter and increases cutting capacity. Four position spindle head bracket for rough milling and extension of cutting area. Circular attachment for forming cylindrical, tapered or spherical shapes. Optical contacting device when rough milling. Line milling device for rough and finish milling in longitudinal and transverse lines.

SEE THESE MACHINES IN OPERATION AT COSA'S NEW YORK SHOW ROOM OR SEND FOR DESCRIPTIVE LITERATURE.

Other Deckel Machines for Tooling and Production
UNIVERSAL MILLERS
2 DIMENSIONAL ENGRAVERS
3 DIMENSIONAL ENGRAVERS
UNIVERSAL TOOL & CUTTER GRINDERS

COSA CORPORATION

405 Lexington Ave., New York 17

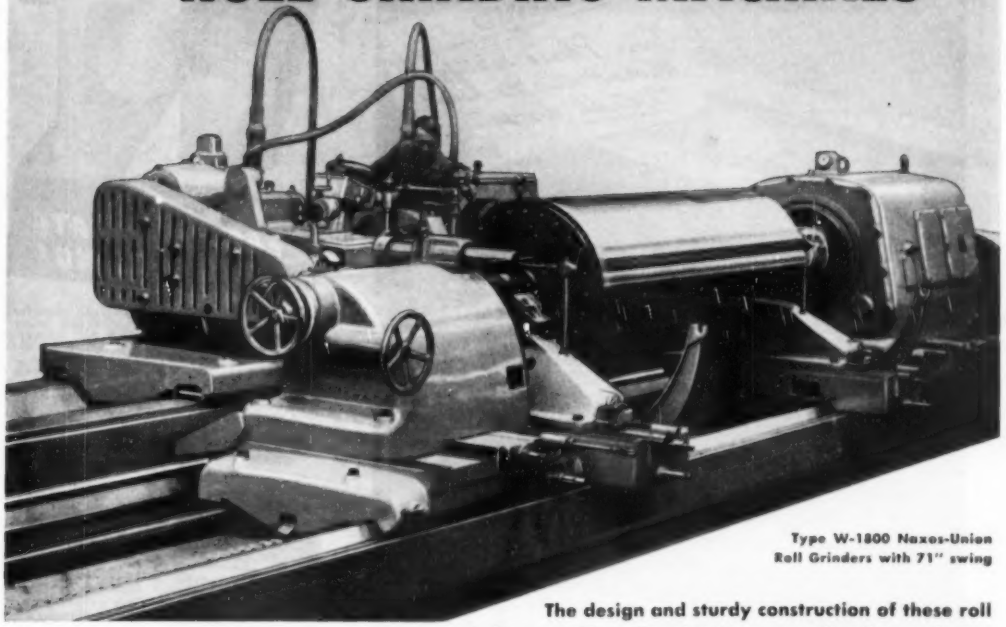
Your source for all Precision Machine Tools— from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

For ACCURATE ROLL GRINDING

NAXOS-UNION

ROLL GRINDING MACHINES



Type W-1800 Naxos-Union Roll Grinders with 71" swing

The design and sturdy construction of these roll grinders provides vibration-free operation for producing accurately ground roll shapes with extremely high surface finishes. Further to improve grinding accuracy, the machines have an automatic compensating device for wheel wear and a micro feed for feeding grinding wheel within limits of 0.00004". Convex and concave roll contours are ground precisely with a specially designed cam-controlled grinding attachment. These machines are built by Naxos-Union, Germany, who have many years of experience in building roll grinders and other precision grinding machines.

CAPACITIES

Model	W-500	W-1000	W-1800
Maximum Grinding Diameter	20"	40"	71"
Minimum Grinding Diameter	4"	6"	6"
Maximum Weight of Workpiece			
(a) Between Centers	2 Tons	10 Tons	20 Tons
(b) With Steady Rests	—	20 Tons	50 Tons

Send us the details of your roll grinding jobs. Cosa engineers will gladly recommend the most suitable equipment.

COSA CORPORATION
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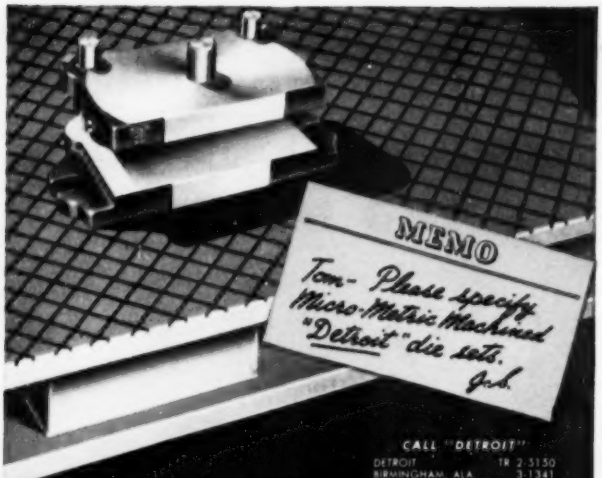
Your source for all Precision Machine Tools— from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.



"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.

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HAMILTON, CAN.	9-2683
INDIANAPOLIS	HU 5674
KANSAS CITY, MO.	VI 3558
LOS ANGELES	AD 7251
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NEWARK	MA 2-4318
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ST. LOUIS	FR 6811
ST. PAUL	CE 1600
TOLEDO	MA 4510
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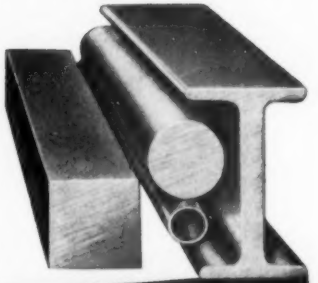
DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SET ★

Atlantic
WAVY SET BANDS . . .



FOR FAST, ACCURATE GANG CUTTING!

Specially designed teeth clear away chips for speedier—cooler—precise cutting. Atlantic Wavy Set Bands have precision milled, even set teeth that slice through multiple drill rods, bar stock, I beams or tubing for gang cutting efficiency. Increased blade flexibility and uniformly heat hardened teeth make this—like Atlantic's complete saw line—supreme in durability, operating efficiency and dollar saving economy.

ATLANTIC QUALITY CONTROL STARTS HERE . . .

The band saw teeth—and only the teeth are scientifically hardened to guarantee the sharpest, keenest cutting edge. The entire saw body remains flexible. This precision heat treating increases blade life—saves blades, down time and dollars!

Atlantic engineered with a wave of teeth to the left, then to the right to sweep away chips during cutting. Saw operation is Free! Easy! Efficient! Better finishes result with no chips to score or mar work.

FREE!

This pictorial story on Atlantic Wavy Set Bands. Send for your copy today. Have you a specific band saw problem? Include a brief description—it will meet with interested engineering attention and will be promptly acknowledged.

Atlantic
ATLANTIC SAW MFG. COMPANY, Inc.
158 Brewery St., New Haven, Conn.

From the *American Machinist* Library of *Tips for Top Shop Men*

GET to know your people *before* you have to get tough with 'em. It's poor policy to make their acquaintance by bawling 'em out. Introduction by insult is no longer a successful management routine.

THE old Army slogan, "If it moves, salute it; if it doesn't, pick it up; if you can't pick it up, paint it," can well be adapted for plant use by changing "salute" to "guard" and "paint" to "oil."

LET OAKITE
SOLVENT DETERGENTS
DO YOUR HEAVY
METAL CLEANING

DO YOU KNOW
THEIR 9 BIG ADVANTAGES?

See booklet—page 7

This FREE Booklet on Solvent Detergents

TELLS HOW two types of Oakite-developed cleaners make it easier and cheaper for you to do many difficult metal-cleaning jobs. Here are some of the subjects covered in the booklet:

Cleaning action of solvent detergents

Four functions of Oakite solvent detergents

1. **Cleaning metal between processing operations**
2. **Precleaning before painting or plating**
3. **Stripping paint**
4. **Providing temporary protection against rust**

Four ways to use Oakite solvent detergents

1. **In spray-washing machines**
2. **In soak tanks**
3. **With special spray-rinse equipment**
4. **By hand application**

FREE Write for a copy of this 24-page booklet, illustrated with photographs and diagrams.

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MATERIALS • METHODS • SERVICE

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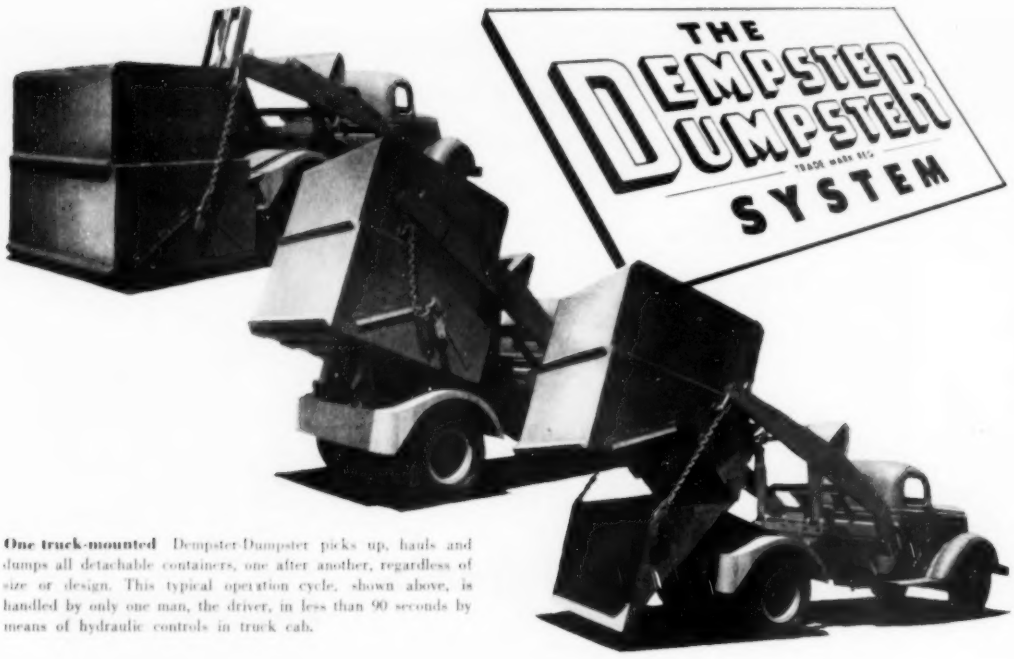
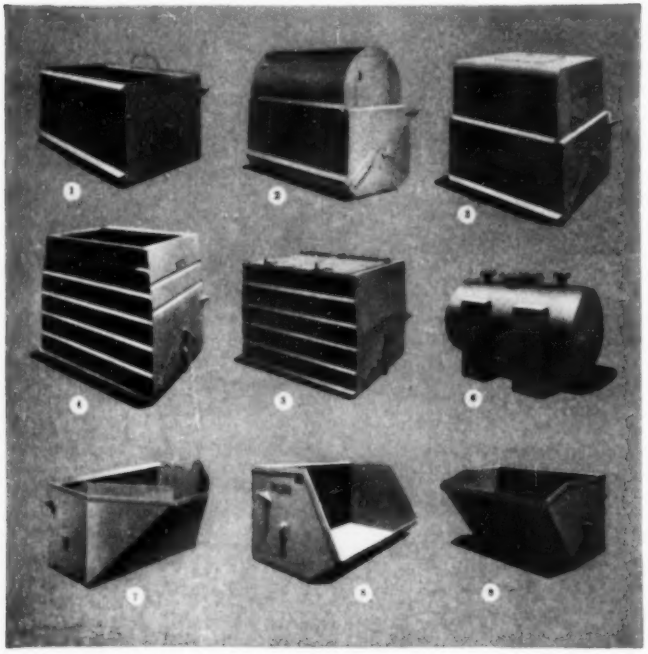


One truck-mounted Dempster-Dumpster picks up, hauls and dumps all detachable containers, one after another, regardless of size or design. This typical operation cycle, shown above, is handled by only one man, the driver, in less than 90 seconds by means of hydraulic controls in truck cab.



1—Cuts Cost of Equipment and Operation— It is not unusual for one Dempster-Dumpster to perform the work of from 3 to 5 conventional trucks . . . reducing investment accordingly. Eliminating trucks also means eliminating tires, gas, oil, maintenance and man hours.

3—Eliminates Re-Handling of Materials— Re-handling of materials, which by conventional methods are hand loaded by loading crews into dump trucks, is eliminated. Each detachable container remains at its convenient location until loaded. Then, in less than a minute, it is picked up by Dempster-Dumpster and taken to destination. There it is dumped or set down intact . . . saving hundreds of man hours annually.

• • •

At left are a few standard containers for general requirements—1—Drop Bottom Container built up to 10 cu. yd. capacity to handle heavy materials. 2—Apartment Type for bulk trash and rubbish with sump bottom for handling moist materials. 3—Universal Type available with top and end doors. 4—Drop Bottom Pressed Steel Type for lighter service. 5—Drop Bottom Pressed Steel Type with counterbalanced spring lids. 6—Tank Type Container meeting A.S.M.E. specifications. Capacities up to 1,200 gallons. 7—Tilt Type with Converged Lip for handling fine aggregate, wet or fluid materials. 8—Skip Type with Lip to assist in holding certain types of loaded materials in place. 9—Tilt Type for handling heavy materials. Built water-tight.

DEMPSTER BROTHERS

MOST EFFICIENT METHOD OF MATERIALS HANDLING BY TRUCK EVER DEVISED

If you collect and move bulky, light or heavy materials in your plant operation . . . be they solid, liquid, dust, rubbish or waste, the Dempster-Dumpster System merits your careful consideration and investigation. This revolutionary method of bulk materials handling by truck can save you thousands of dollars annually!

The fundamental reason why the Dempster-Dumpster System is the most efficient method of materials handling by truck is because, in this system, one truck serves scores of detachable containers. In other words, a truck-mounted Dempster-Dumpster . . . with only one man, the driver . . . picks up, hauls, dumps or sets down intact . . . one after another . . . any required number of big Dempster-Dumpster Containers.

The hydraulically operated Dempster-Dumpster is mounted on any make truck chassis of suitable size.

The steel containers are available in a wide variety of designs best suited to the type of materials handled—be they bulky, light or heavy . . . solids, liquids or dust . . . trash or rubbish. They range in size up to more than three times the capacity of the average dump truck body. The containers are spotted inside and outside your plant at convenient materials accumulation points. A few of the dozens of detachable containers are shown here so that you may see the flexibility of this system in handling all types of materials in your plant with one truck. It may be that none of these containers will fit your own particular need. But remember there are Dempster-Dumpster Containers that will, either standard or special design.

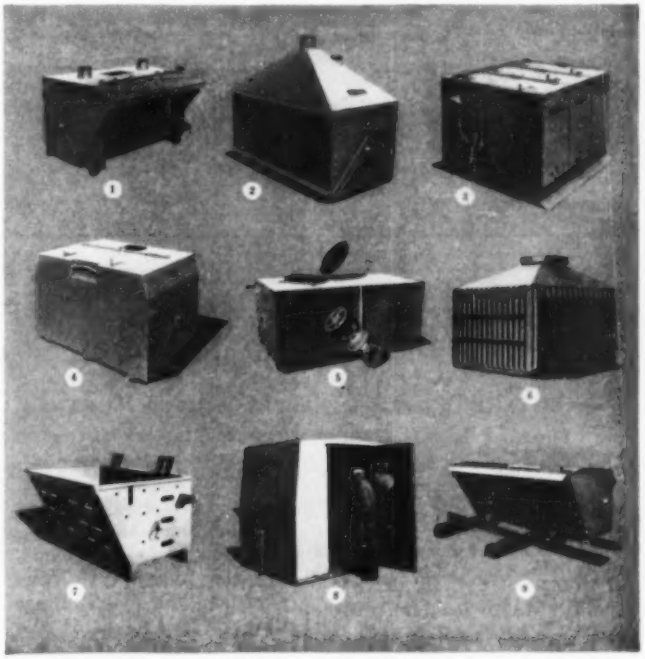
More efficient and lower cost materials handling in your plant may be simply a matter of getting the probing minds of your engineers and ours together. Our files contain hundreds of inquiring letters that ultimately resulted in savings of thousands of dollars annually in every conceivable type of manufacturing plant. A discussion with our engineers might develop the same results for you. If advisable, they will be glad to make, without obligation on your part, a proper survey to determine just what equipment you may need. The Dempster-Dumpster System is manufactured exclusively by Dempster Brothers, Inc.

2—Eliminates Standing Idle Time—One man, the truck driver, replaces truck loading crew. Detachable containers are pre-loaded through normal accumulation. Truck-mounted Dempster-Dumpster and driver never stand idle because there is always a pre-loaded detachable container to be serviced.

4—Increases Efficiency, Sanitation and Good "Housekeeping"—The Demp-Dumpster System is a complete, unified plan for area-wide materials handling. Materials to be disposed of or transferred are placed in a nearby container as they accumulate. Containers used for trash and rubbish are fire-proof, rat-proof and fly-proof. No other method of materials handling by truck can match the Dempster-Dumpster System in efficiency and low operating cost!

• • •

At right are a few containers built for special requirements—1—Five cu. yd. container with swivel casters for handling waste blast sand. 2—Three cu. yd. Dust Collector Type equipped with gaskets. 3—Multi-Karry Container equipped with three 2 cu. yd. steel boxes with casters and lids. 4—Six cu. yd. drop bottom container with two spring-hinged lids and special loading opening in top. 5—Rectangular Tank Type Container with gate valve and gasketed Lid. 6—Chlorinator Ash Container designed for handling hot residue approximately 1500° F. 7—Tilt Type Container built for cast linings for handling hot materials. 8—One of several special "Tool and Equipment" Type Containers. 9—One of several types of special built containers equipped with ball bearing trucks.



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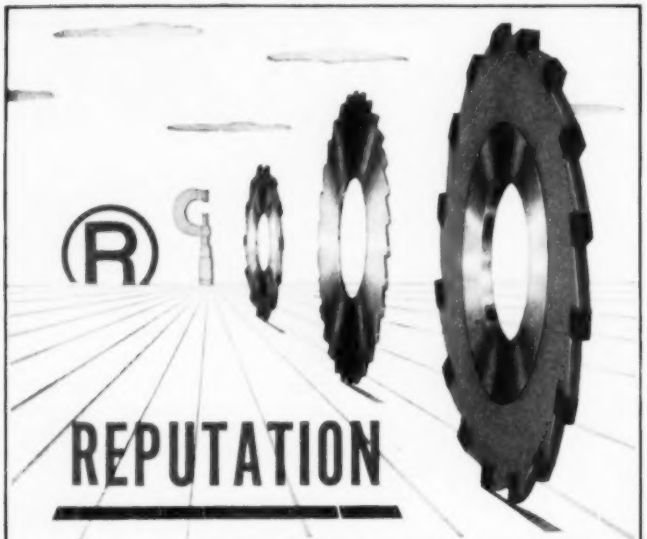

REPUTATION

At Circle R, we have a heavy investment in reputation. Since 1923, the reputation of our product has become entrenched — because ever since this company was established we have produced only the best. Far from resting on our prestige, we are committed to progressive policies — as if we had our reputation still to win.

Reputation guarantees our circular cutting tools to be of highest quality. You'll find them also the most efficient and economical you can buy.

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MOLY

AM-9 MS-9

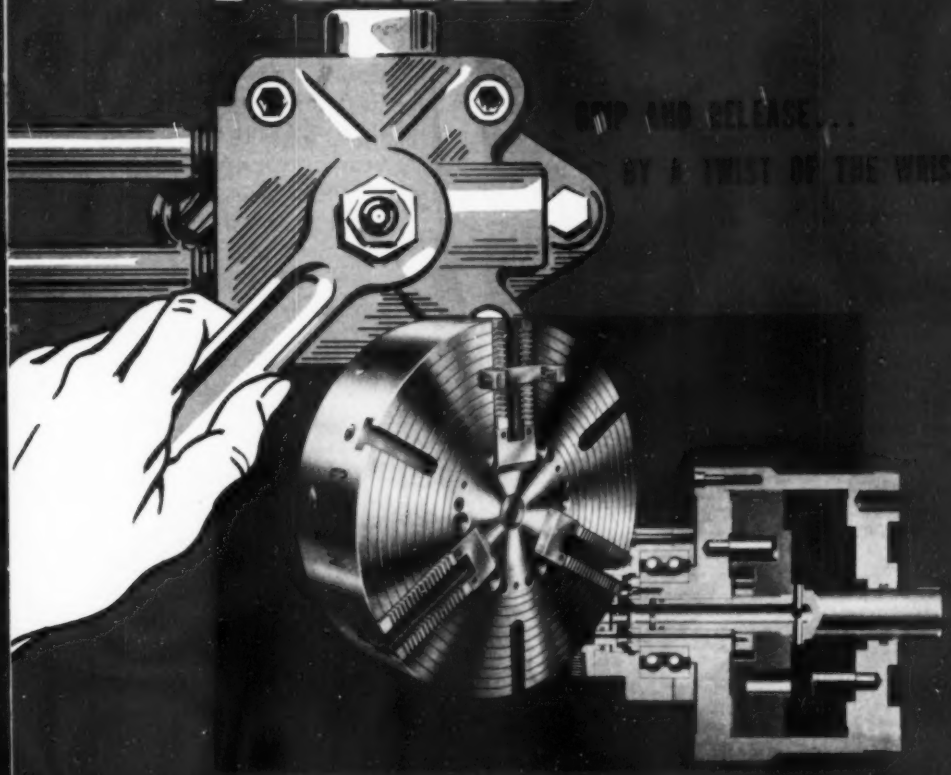
From the *American Machinist* Library of *Tips for Top Shop Men*

SABOTAGE is a greater potential danger for most plants than bombing. Have you taken any precautions to guard against it?

MORALE isn't built in a crisis; it's built beforehand. The crisis only tests it.

THERE'S an old saying that "If you want to be big, you've got to look big." Nobody likes a fourflusher or a fop, but everybody has been trained from childhood to expect a leader to look like one. Company policy can't earn respect on the major things either, if it is small on the minor things. Don't make your company look small.

CONSERVE YOUR MAN-POWER



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BY A TWIST OF THE WRIST

CUSHMAN

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94% VOTED
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MORE UNIFORM!
Our 'experts' were engineers, architects, draftsmen, purchasing agents—drawing pencil buyers and users like yourself.
The test they made was to compare the uniformity of 3 MICROTOMIC pencils of the same degree, with that of 3 same-degree pencils they were then using.
459 of them—an amazing 94% of those who made the test—picked the New MICROTOMIC Drawing Pencil as "more uniform"!
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Proper application of clad materials can cut costs and save scarce metal. Output of clad materials has more than doubled since 1946 . . . has climbed to more than 23,000 tons per year and may reach 1,000,000 tons by 1960. Clad materials offer advantages that may well have profit-wise applications in your business.

Clad materials are not difficult to work, require only care and routine experience. "How to Work Clad Materials," an *American Machinist* Special Editorial Report, contains all the latest facts on how to work clad materials most efficiently and profitably. This 16-page report, complete with informative drawings, diagrams, and photographs, is still available for only 25¢ a copy. Write to Reader Service Department:

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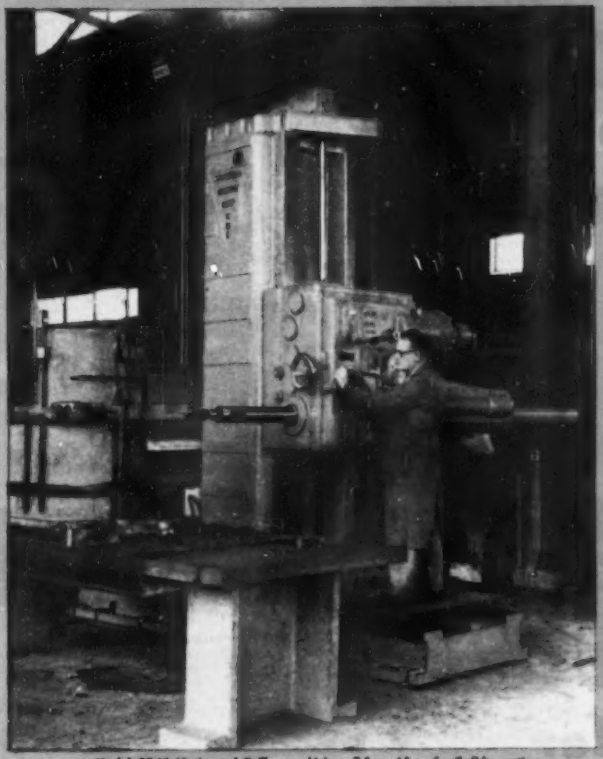
McGraw-Hill Building
New York 36, N. Y.

Kaukauna UNIVERSAL AND HORIZONTAL DRILLING AND TAPPING Machines



Model 3040 Horizontal Drill—machining all four sides of rail slide casting.

CUT COSTS ON SETUP TIME, CRANE TIME, FIXTURING MACHINE HOURS

. . . drive boring fixtures and perform drilling, reaming, boring, counterboring, tapping and spotfacing operations on any size or shape from small production parts to large unwieldy workpieces.

Model 3040 is a sturdy rugged horizontal drilling machine with 10 HP, 15HP or 20HP spindle motor and unusual column rigidity. Maximum productivity assured by use of highest feeds and speeds permissible with modern cutting tools.

Other horizontal models have tilting head or horizontal head and 360° column swivel. Universal models with compound head swivel permit angular, radial and horizontal machining operations with one setup. Machines designed for both portable and stationary applications. Extended runway travel and column height available on all models. Special adaptations to handle your machining problems.

WRITE FOR CATALOG

Model 135-U Universal Drill—drilling, tapping and decarbing rocks in place on boring machine runway.

Model 135-HR Horizontal Drill—used with revolving table to drill and tap tractor frames.

Model 1030 Horizontal Drill—performing drilling, tapping and boring operations on milling machine column.

Special Model 140-U with extended column, runway, and reach—for drilling Diesel Engine heads and blocks.

KMC

Kaukauna MACHINE CORPORATION

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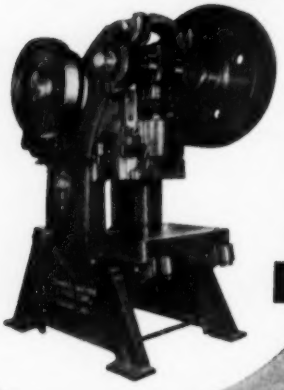
EXTRA SERVICE
EXTRA SAFETY
15 MODELS
16 to 90 Ton
JOHNSON
Bonus Built
POWER PRESSES



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RUGGED • DEPENDABLE • TIME-TESTED

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for mild steel up to 10 gauge

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SINCE 1929 APPLETON WISCONSIN

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Reliability—Strength

The Walker "Concentric Gap" Magnetic Chuck meets day-in, day-out requirements for a powerful chuck. For more than forty years, with a basic electro-magnetic circuit, the Walker "Concentric Gap" Chuck has proven itself reliable, efficient and economical.

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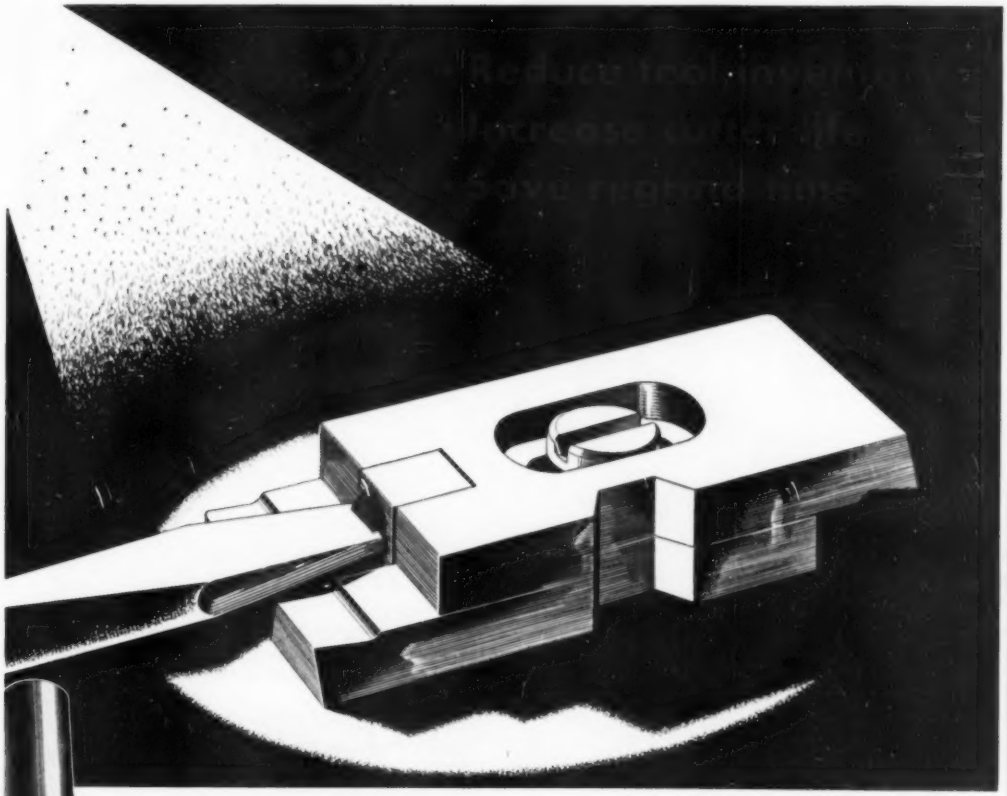
Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special Applications for various holding problems . . . Demagnetizers . . . Magnetic Clutches.

Original Designers and Builders of Magnetic Chucks
O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS



with Madison cutters' one screw adjustment!

Even after many regrinds Madison cutters can be re-set to size within the expandable range of the cutter . . . in large diameters this means as much as $\frac{5}{8}$ of an inch. Often one Madison cutter can be used for several different jobs, reducing your tool inventory investment.

It's not necessary to regrind Madison cutters to exact tolerances. Just sharpen the cutting edges . . . then set to the exact size you need for the job. You can easily see how that saves on grinding time.

And because only one screw is used to adjust a Madison cutter there's no chance of off-center adjustment . . . both edges cut equally — lengthening cutter life.

HERE'S HOW ONE SCREW ADJUSTMENT WORKS—With a screwdriver, loosen locking screw. Using the micrometer adjusting screw, set cutter to desired size. Tighten locking screw and cutter is ready for use.

Write for your copy of the fact-packed Madison catalog. It's yours for the asking.

ask the men with holes in their heads to cut your boring costs

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Precision PLUS +

for
GAGE GRINDING
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OTHER
CLOSE
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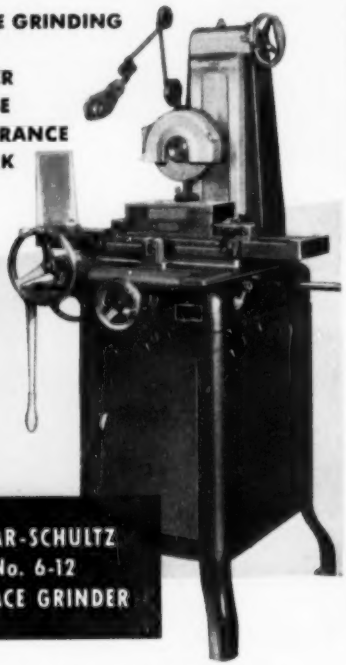

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No. 6-12
SURFACE GRINDER

HERE is the New Grinder Sensation of the decade . . . with all the features the metal working industry has been talking about PLUS—

Flatness and parallelism GUARANTEED to within 2/10 (.0002). Low First Cost. Easy Operation. 8 to 10 Weeks Delivery.

The excellent performance of this machine tool, that has been *proved* in so many shops, is the net result of unusually sturdy design, fine quality materials and the untiring efforts of skilled craftsmen who know what a fine precision machine tool should do.

Boyar-Schultz No. 6-18 Surface Grinder

A heavy duty, precision tool room machine built for sustained accuracy in both tool room and in production.

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for larger precision work

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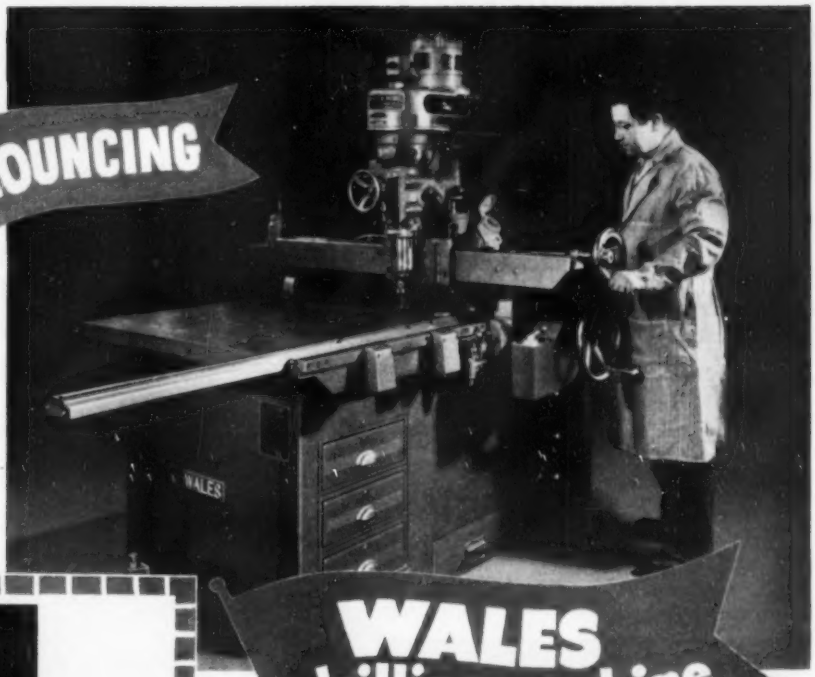
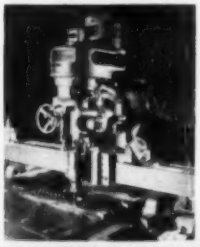
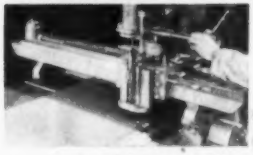


WALES drilling machine with new boring head



BORING

Close-up of boring operation on Wales Deluxe Model Drilling Machine.



DRILLING & REAMING

Showing a hole in the work being reamed by simply interchanging the drill and bushing with corresponding size reamer and reamer bushing.

SCAN-A-SCALES

Showing the 2 built-in "Scan-A-Scales" that accurately locate drill head and slide rail for "zeroing in". Air locking clamps hold the work rigid during drilling operations.

WALES new Deluxe Model Drilling Machine has been developed for more versatile operations including BORING, DRILLING, REAMING and CLOSE TOLERANCE LOCATING. *There is no other boring and drilling machine or jig borer like it.* Precision, speed and ease of operation are built right into this machine.

Accuracy is the primary consideration in manufacturing this exclusive Wales Drilling Machine that handles material of practically any length and up to 36" wide.

A pair of built-in "Scan-A-Scales" calibrated in one ten thousandths of an inch accurately locate head and slide rail after rough positioning by rapid traverse.

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Specialists in Punching and Notching Equipment

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The new material is a carbide of chromium and is identified to the trade as CROBLOX.

In addition to its long wearing qualities commonly associated with carbide, CROBLOX has the same coefficient of expansion as steel, a factor that makes it easy to use in measurement of split-tenths.

CROBLOX not only avoids the thermal expansion factor of ordinary carbide, it also has greater resistance to corrosion making it possible to use them under all types of atmospheric conditions.

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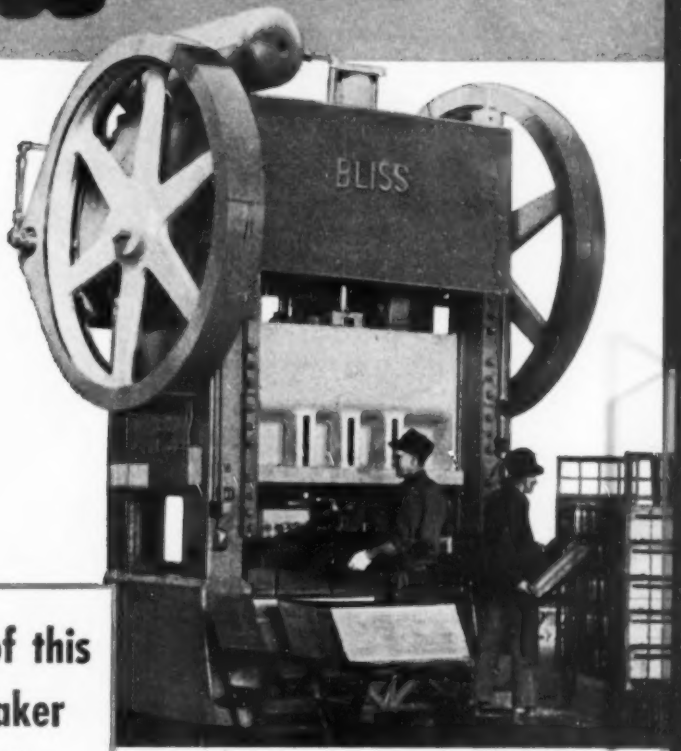
LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

The trend is to more stampings WITH BLISS PRESSES...



NEW 250-TON PRESS is typical of modern Bliss installations at Corry-Jamestown Mfg. Corp. This straight-side press features a sturdy box-frame construction and extra-long slide adjustment.

95% of presses of this leading desk maker are Bliss-Built!

When it comes to making steel office desks and files, Corry-Jamestown Mfg. Corp., Corry, Pa., is an acknowledged leader. And when it comes to choosing press equipment, Corry naturally turns to the leader in the press field—Bliss.

Throughout Corry-Jamestown's three plants, 95% of the presses are *Bliss-Built*. And in its newest plant, *100%* of the presses over 10-ton capacity are *Bliss-Built*.

Rugged Bliss Straight-Side and Inclinable Presses have helped Corry maintain high quality, speed production, and minimize costs of stampings for its "STEEL AGE" desks and files.

Your local Bliss sales engineer—the trained representative of the world's largest press builder—can show you why Bliss belongs in *your* press room. Remember, Bliss can supply the right press for a given job or a complete press room.

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BLISS

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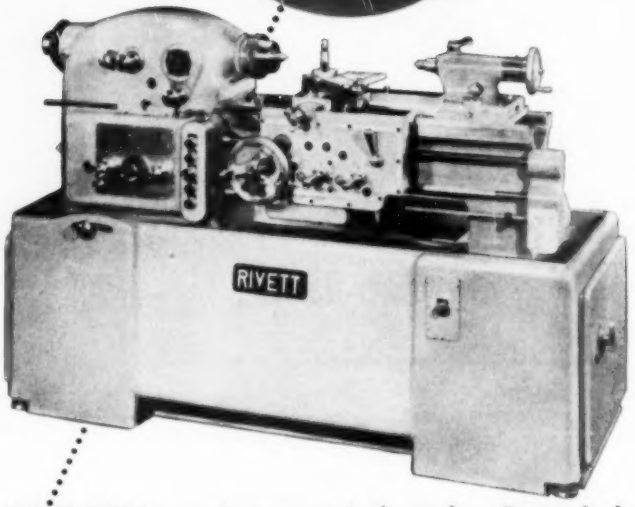
2 FOR 1



RIVETT 1020S

HAS WHAT IT TAKES TO MAKE AN OUTSTANDING LATHE

★ 40% heavier than comparable lathes. Weighs 3900 lbs. ★ Back gearing for power cuts—belt drive free of all gearing for high speeds. Range from 22 to 3600 R.P.M. ★ 12¾" wide hardened steel ways of bed absorb heavy cutting force. ★ Infinite spindle speeds through trouble-free mechanical drive. ★ Push button controls for complete operation. ★ Neutral clutch stops spindle without stopping drive. ★ Three bearing mounts for spindle. ★ Collets mount directly in spindle. ★ Hand wheel for turning headstock spindle ★ Anti-friction bearings used throughout. ★ Gear box gives 72 feeds and 84 threads from 2 to 240 per inch. ★ Automatic lubrication. ★ Hardened and ground feed screws.

RIVETT 1020S is an Instrument Lathe and an Engine Lathe

A double-duty machine—combining the feather-touch sensitivity of an instrument lathe with that heavy-biting ruggedness which carbide cutting tools require. This powerful geared-head lathe qualifies for any turning within its 12½" swing and 20" centers.

Bulletin 1020A has proof of how outstanding this Rivett would be in your shop. Write for copy today.

RIVETT LATHE & GRINDER, Inc.

Dept. AMR-9, Brighton 35, Boston, Massachusetts

You can use other lathes . . . or employ other types of metalworking machines . . . but on no other tool can you get so much production with such fine precision as on a Rivett.

Use WELDED STEEL for Greater Strength with Less Weight!

Illustrated above are parts of a pneumatic pipeline conveying system. Each unit embodies an Air Operated Swing Check Valve and Lower Pressure Chamber. These completely machined and assembled units, together with those at the left, are presented as further evidence of the versatility of the Mahon organization in producing and machining Steel-Weld Fabricated parts and assemblies for hundreds of manufacturers throughout the country. If you have parts or assemblies in your product that could be redesigned and produced to better advantage from a strength—weight—bulk standpoint, or, if you are faced with a limited production on an item involving heavy pieces in which pattern costs are a consideration, you can turn to Mahon with confidence. You will find in the Mahon organization a unique source with complete, modern fabricating, machining and handling equipment to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication.

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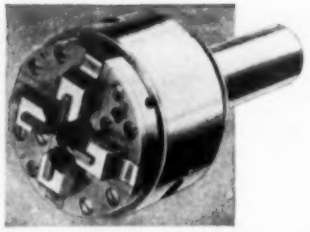
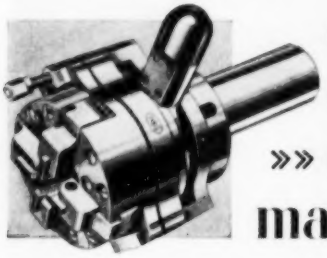
DETROIT 34, MICHIGAN

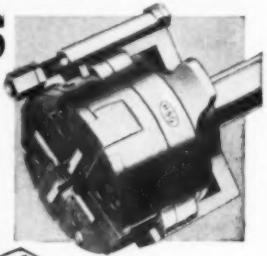
Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

An IDLE man at a BUSY automatic spells profits »» a BUSY man at an IDLE machine spells LOSS







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Compact sturdy construction, precision engineered for long, uninterrupted heavy duty operation.

Has small, well protected solenoid—operates small cylinders up to 3" dia. and larger cylinders where unusual speeds are not required.

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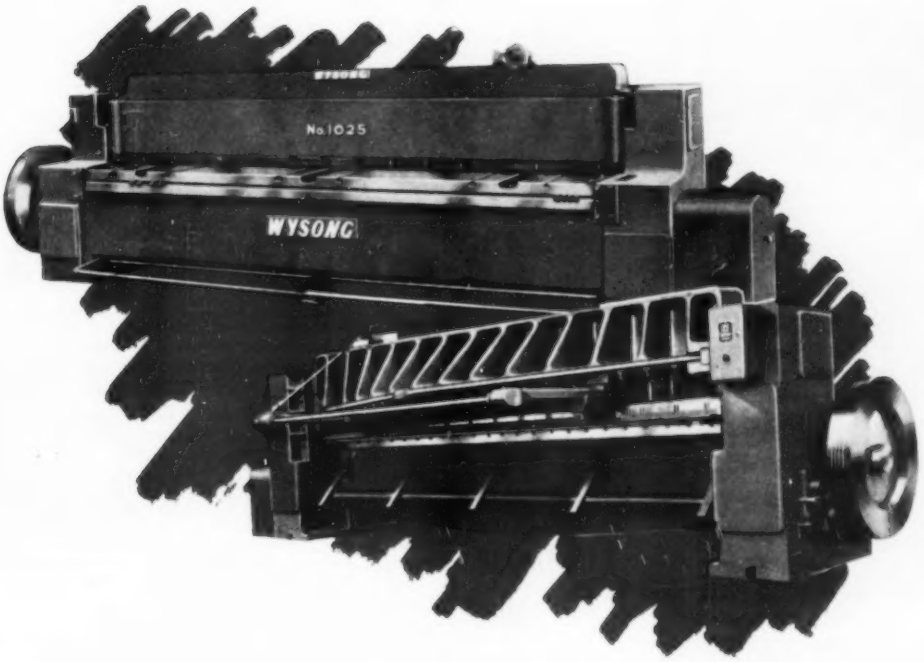

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No matter how you look at it you can see the massive, rigid construction of the WYSONG ¼-inch series . . . made in 4, 6, 8, and 10 feet cutting lengths. Bed, end frames, and knife bar are one-piece Hi-tensile castings. Bearing surfaces between end frames and table, and gibbed ways for hold-down and knife bar travel are hand scraped for perfect fit and true squaring.

A clearly visible cutting line makes it easy to cut to a scribed line. Slotted metal finger guard, mounted on hold-down, protects fingers without obstructing view.

An automatic, mechanically operated *hold-down* provides powerful, positive hold down action. The simplicity of the roller and cam action makes it sure and trouble free. Individual compression springs in each foot compensate for varying thicknesses in metal being sheared . . . Front operated, ball-bearing *back gauge*, adjustable to .0078 (1/128th) of an inch, is standard equipment. A *power operated back gauge*, in ranges of 24 and 36 inches can be furnished at extra cost . . . Powerful WYSONG *jaw-type clutch* has built-in non-repeat unit.

For performance . . . feature for feature and dollar for dollar, you can't beat the value of WYSONG squaring shears. Compare the WYSONG line with others in the field . . . and for shear satisfaction, buy WYSONG.

WYSONG builds Squaring Shears in cutting lengths from 3 feet through 12 feet, in motorized, air-power and foot-power models; O. B. I. Presses; Slip Roll Formers; and Rotary Combination Machines. See your dealer or write factory for full information.

Wysong and Miles Company, Greensboro, North Carolina

Illustrated above: Wysong No. 1025, Cap. 10 ft., ¼in., mild steel

WYSONG

MARCINELLE—Plant No. 1

MARCINELLE—Plant No. 2

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are backed by 70 Years' Designing & Engineering Experience plus 4 Modern Plants

Four up-to-the-minute plants, utilizing the accumulated engineering and manufacturing experience of seven generations to produce the finest type electrical equipment, that's ACEC—Ateliers de Constructions Electriques de Charleroi, of Belgium.

And world-famous ACEC motors are now *immediately available* to American customers from warehouse stocks in the United States.

Conforming strictly to NEMA FRAMES AND SPECIFICATIONS, these 1-phase and 3-phase motors are not only products of long experience and scientific research, but of extreme care in manufacture and close attention to mechanical precision. They are built to give every possible satisfaction in service . . . to uphold the world-wide reputation for excellence that ACEC equipment has established.

Branches and representatives of ACEC are located throughout 50 countries, and service in the United States is available from 232 DISTRIBUTORS AND SERVICE SHOPS across the nation.

Whatever your electric motor requirements, write, wire or telephone the nearest ACEC office or representative—or communicate with us directly in New York. Inquiries and orders receive prompt attention.

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NOW ON HAND

Integral Horsepower Electric Motors—(NEMA)

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Available in the following types:

- *Open Drip Proof Motors*
- *Totally Enclosed Fan Cooled Motors*
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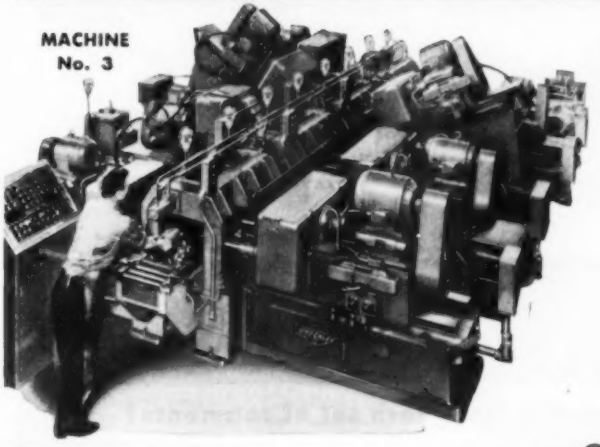
208 OPERATIONS IN 44.3 SECONDS

These recently-built Greenlee transfer machines mill, bore, drill, ream, and tap transmission cases for a well-known automobile. A total of 183 tools complete 208 operations in an automatic cycle time of 44.3 seconds. Features include face and end-milling heads, turnover and chip-cleanout stations, and indicator lights for tool changing. Self-contained hydraulic units conform to JIC standards for easy maintenance. These outstanding machines are among the newest built by Greenlee — a pioneer in progressive transfer-machine principles.

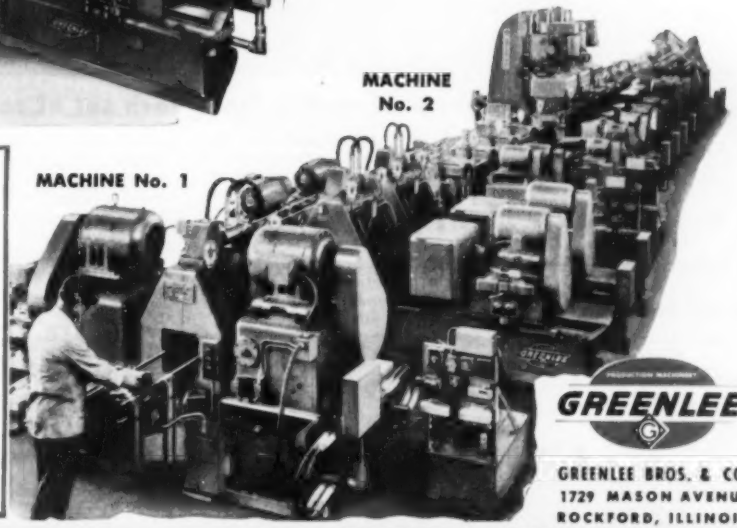
MACHINE No. 4

GREENLEE

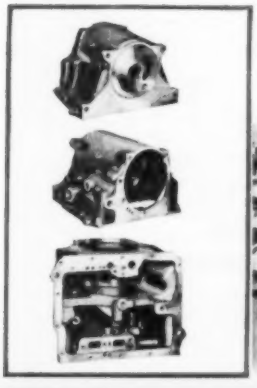


MACHINE No. 3

TRANSFER MACHINES
PROCESS
AUTOMATIC
TRANSMISSION CASES
AT THE PRODUCTION RATE OF
65 CASES PER HOUR



MACHINE No. 2



MACHINE No. 1

GREENLEE

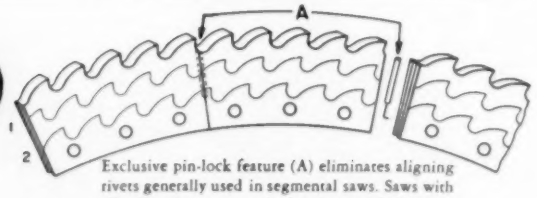
GREENLEE BROS. & CO.
1729 MASON AVENUE
ROCKFORD, ILLINOIS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

NEW

. . . for metal cutting

The Disston Chromos* Segmental Circular Saw



Exclusive pin-lock feature (A) eliminates aligning rivets generally used in segmental saws. Saws with aligning rivets can only be sharpened down to line 1. Disston Chromos can be sharpened down to line 2, giving up to 30% more cutting life.

HENRY DISSTON & SONS KEYSTONE STEELS SAW TOOL FILE WORKS PHILADELPHIA U.S.A.

with up to 30% longer cutting life from each set of segments!

- **Replaceable high-speed steel segments**
- **Tough alloy steel body**
- **Exclusive pin-lock feature**
- **For ferrous or non-ferrous metals**
- **In diameters from 11″ to 63″**

Here's the latest development in segmental circular saws for sawing ferrous and non-ferrous metals. Unlike any other segmental saw, in which segments are joined by rivets, the segments on the Disston Chromos are *locked* together by flexible tightening pins—permanently holding the segments in perfect alignment. This patented design makes possible up to 30% more cutting life because there are no aligning rivets to limit sharpening.

The tooth segments, of high-speed steel, need only infrequent sharpening. Their narrow kerf assures fast, clean cutting with minimum waste. *Segments are quickly replaced and automatically aligned because of the pin-lock feature.* Set after set of segments—each with up to 30% extra life—can be fitted to the non-wearing saw body. The tough steel saw-body of the Disston Chromos will accept the strains and shocks of production cutting. Teeth are accurately indexed so they may be sharpened on automatic machines.

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in Speed and Accuracy

FOR MILLING JOBS!

Kent-Owens Machines "have what it takes" to get your milling jobs done *right!*

They're rapid . . . accurate . . . efficient. Designed to help you *produce more* . . . with *lower costs!* Rugged and dependable in every detail. Practical and versatile.

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No. 1-14 Milling Machine
Table, 32" x 9"
Table travel, 14"

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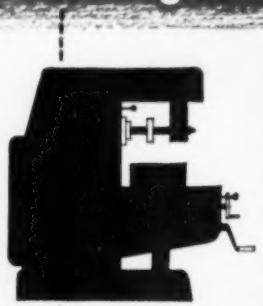
production begins with



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No tools like the right tools! Columbus Die-Tool designs and builds tools, jigs, fixtures and special machinery to meet your most exacting requirements. RESULTS: operating cost that matches your budget; production that matches your schedule; product quality that matches the demands of your market.

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Mississippi Pilots Use Marking Devices

Samuel Clemens adopted his pen name from the expression used by Mississippi River Pilots, such as he, indicating the 2 Fathom Marking Device affixed to their lead lines.

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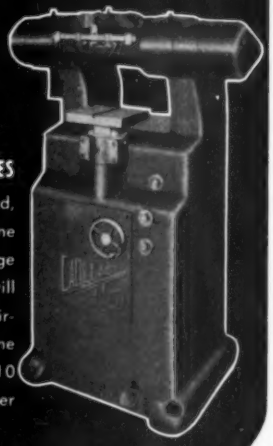
are Designed for
ALL MARKING PURPOSES

Whatever your requirements, from small Hand Stamps to Pneumatic, Hydraulic or especially created Marking Machinery, CADILLAC STAMP COMPANY stands ready to supply or design and build to meet your needs.



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Compact, self-contained, manifold mounted. One control gives full range of marking depth. It will mark round, flat and irregular surfaces. Machine capacity is up to 110 one inch impressions per minute.

SOLID ROLL DIE
Assuring the utmost in accuracy—used in marking machines, lathes and screw machines.

PUNCH PRESS DIE
Faithfully reproduces and is particularly adapted to large production marking.

ROLL TYPE HOLDER
Depending on requirements, can be had for either solid or interchangeable type.

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The LATHE TYPE CUT Means

ACCURACY.. MINIMUM BURR..

ETNA FULLY AUTOMATIC TUBE CUT-OFF MACHINES

SPEED...ECONOMY...EFFICIENCY...VERSATILITY

The Etna Cutoff is completely automatic and hydraulically operated. The tube remains stationary . . . it's the cutter head that rotates . . . making a lathe type cut with *minimum burr*. Random long lengths of tubing can be recut to precise lengths ranging from .125 to 48 inches with a length tolerance of less than 5 thousandths of an inch with the Etna Automatic Tube Cut-Off Machine. Write for the Etna Tube Cut-Off Brochure.

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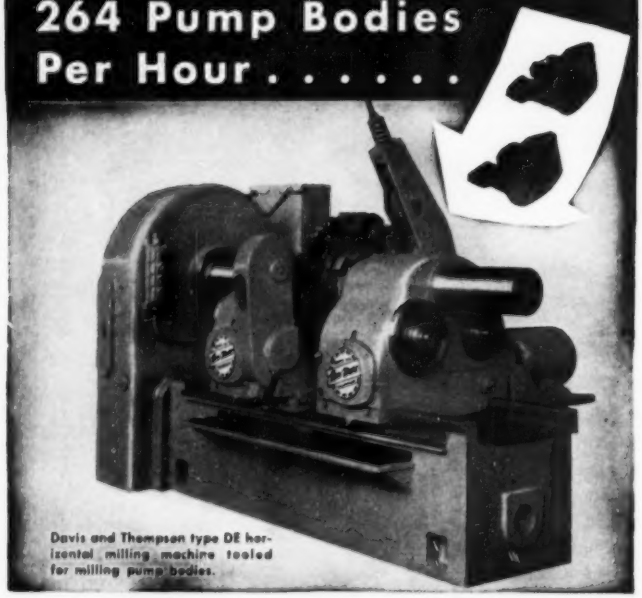
HEAVY DUTY TUBE MILLS...HEAVY DUTY SWAGING MACHINES...
FOR MORE THAN HALF A CENTURY

THE ETNA MACHINE CO.

3402 MAPLEWOOD AVE., TOLEDO 10, OHIO

264 Pump Bodies Per Hour . . . . . .



Davis and Thompson type DE horizontal milling machine tooled for milling pump bodies.

1-A Standard Horizontal Milling Machine

Oil pump bodies requiring high degree of finish and high production are rough and finish milled on both sides simultaneously with this Davis and Thompson type DE milling machine. Production is 264 pieces per hour.

Patented Angular Spindle Adjustment Allows "Toe Cutting"—Maintains Fine Finish at High Production

The finishing spindle is provided with an exclusive D&T design which allows angular adjustment. This in turn results in "toe-cutting" and eliminates "drag" of the cutter over the finished surface. Both roughing and finishing spindles have micrometer endwise adjustment.

A Basically Standard Machine Employing Roto-Matic Principle For High Production Special Milling

Like all D&T machines this model DE is designed for long life and trouble-free operation. Each head has independent drive. There is backlash take up to mandrel. Anti-friction bearings throughout. Rapid traverse between cuts can be incorporated.

Free Data will be furnished upon request.

DAVIS and Roto-Matic THOMPSON

Davis & Thompson Company

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Use HI-EFF machines for balancing fans, impellers, tires, grinding wheels, brake drums, sheaves, pulleys and many other products. 300 auto fans per hour, 200 auto tires per hour, 80 grinding wheels per hour, 60 clutch assemblies per hour . . . these are typical reports from users.

HI-EFF Static Balancing Machines are now offered in nine different capacity models—and other models are available to meet special requirements. Taylor engineers will be glad to make recommendations for your specific problem. *Write for descriptive Bulletin No. 761.*

● DYNAMOMETERS ● STATIC BALANCERS
PRECISION DRILLING MACHINES

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528 WEST HIGHLAND
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PUT SMALL JOBS ON THIS **LINLEY MACHINE**

and save your larger machines for heavier work.

YOU'LL BE SURPRISED! at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7" x 17½" table size.

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DELCO

When you need motors—to serve as a *part* of your product or to help you *make* your product—look to Delco for the motors that will serve you best.

Delco produces motors for practically every known purpose . . . and each Delco motor is *engineered* for the kind of work it has to do. It's made of the finest materials, and constructed to stand up longer under the roughest conditions.

So check on Delco. You'll find Delco motors fit your needs, and that Delco always delivers on time. For complete details, write to Delco Products, Dayton, Ohio, or call the nearest sales office listed below.

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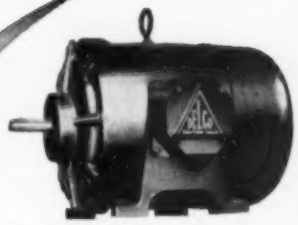
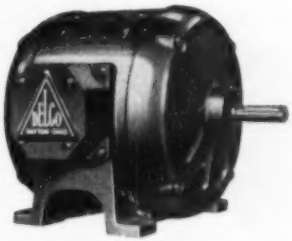
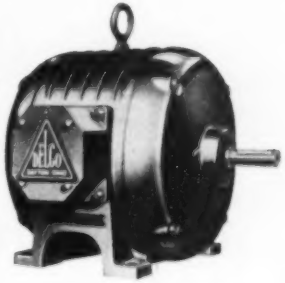


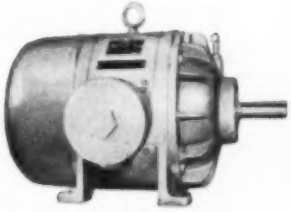
TOTALLY ENCLOSED FAN-COOLED MOTOR



OPEN BALL-BEARING MOTOR



TOTALLY ENCLOSED MOTOR



EXPLOSION-PROOF MOTOR

DELCO FEATURES MAKE DELCO FINEST

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Mac-it

PRONOUNCED "MACK-IT"

Mac-it ⅜" x 2½" Hollow Set Screws have grip of more than 17,000 pounds.

Built for Strength!

For the toughest kind of fastening jobs, the complete Mac-it line of heat-treated, alloy steel screws will give you the strength you need *where you need it!*

Mac-it's 38 years' experience in the manufacture of these top-quality fasteners is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada.

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Hollow Lock Screws
Socket Head Cap Screws
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. . . and many others

Marketed Nationally Since 1913 by

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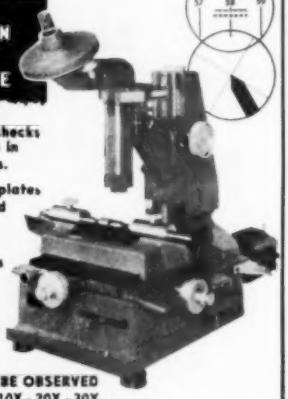
Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.

NEW LEITZ

TOOLMAKER MICROSCOPE

...PRODUCES HIGHEST PRECISION
....CUTS INSPECTION TIME



The NEW LEITZ DESIGN checks angular measurements in degrees and minutes.

Contains all Thread Templates for U. S. National thread profiles 6-80 pitch.

Contains Radii Templates from 21/64" to 13/16" by 1/64". Concentric circles from .010" to .280" by .010" and one blank compartment.

NOTE: TEMPLATES CAN BE OBSERVED IN 3 MAGNIFICATIONS: 10X - 20X - 30X

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GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200-D LAFAYETTE ST. • N.Y. 12, N.Y.

YOU CAN DEPEND ON

Staples QUALITY

IN CIRCULAR CARBIDE-TIPPED TOOLS

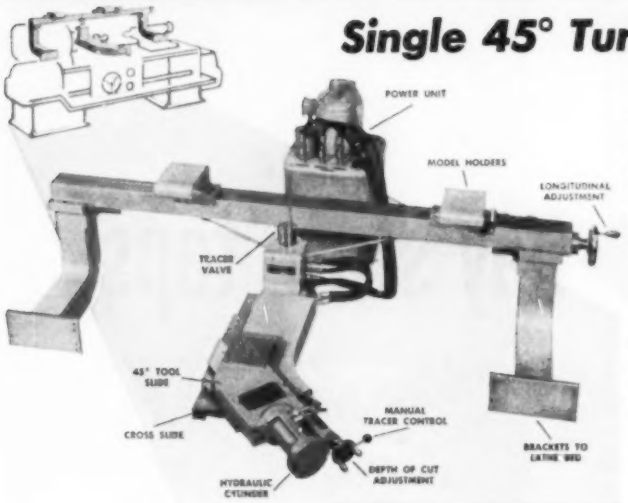
Here's the tool that gives greatest economy for all types of hand and power driven line reaming or accurate piloted reaming, the Staples Carbide-Tipped Shell Type Expansion Reamer. To compensate for wear, the reamer shell is expanded to original diameter by driving it up the tapered arbor. A new tool is obtained simply by replacing the worn shell.

Ask the shops that use them! They'll tell you that Staples Tools are the tools with the built-in bonus of greater accuracy and better performance . . . that they produce more work, with greater precision, and with minimum servicing. For maximum return on your tool investment, put Staples Tools to work in your production.

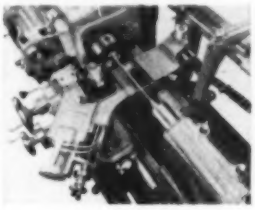
THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio
Distributors in Major Cities
Staples CARBIDE-TIPPED CUTTING TOOLS
A complete line of Circular Carbide Tipped Cutting Tools
Expansion Reamers — Special Tools

Convert your standard lathes to produce more jobs, faster, better with Turchan hydraulic duplicators

Single 45° Turchan Attachment

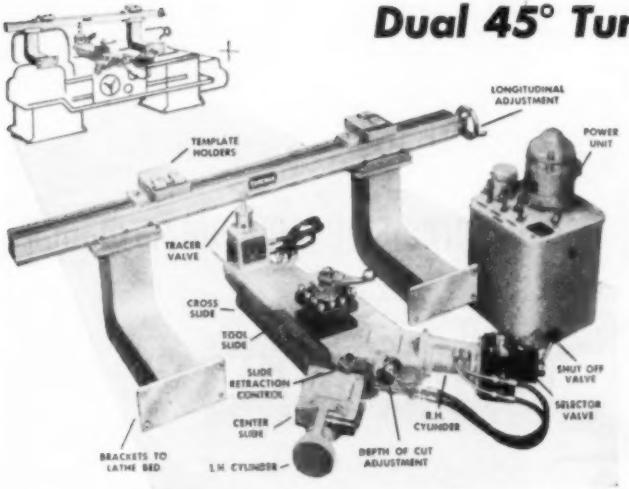


Aircraft, armament and civilian plants report 4 to 6 times more production of parts with Turchan equipment. This method duplicates work shapes from a model or template by means of hydraulically controlled tools taking uninterrupted cuts over the work. The attachment replaces the regular cross slide, operating at a 45° angle. Special form tools and skilled help are not required. Job set-up time becomes a matter of minutes.

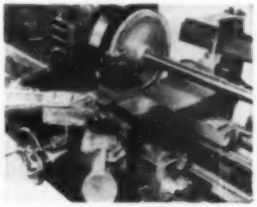


Whether turning a delicate valve stem or a large mill roll, the Turchan automatically duplicates it faster, more accurately.

Dual 45° Turchan Attachment



This twin slide arrangement *doubles* tool approach to the work. Right or left square shoulders, bevels, tapers, steps, undercuts, radii, and intricate contour facing is done with the ease of simple turning. Faster, more accurate work, to .001 variation, with fine surface finish, results in tremendous savings. Any size, make or model standard lathe can be equipped with the Turchan duplicating attachment. "Turn to Turchan to cut costs."



The dual slide duplicator machining a jet engine part, turns shaft and faces disc in a single set-up, to close tolerances.

NEW CATALOG
Write for 20-page illustrated booklet showing how Turchan can cut your production costs.

WRITE US TODAY: Send a sketch and specifications of any job. Give make of machine. We'll show you how to produce it better, faster, at lower cost.

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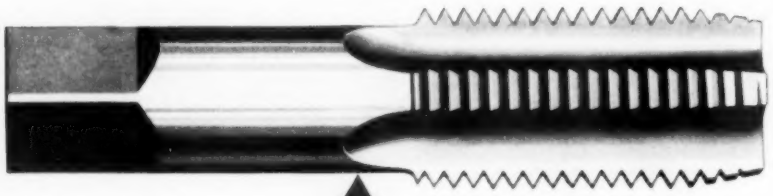
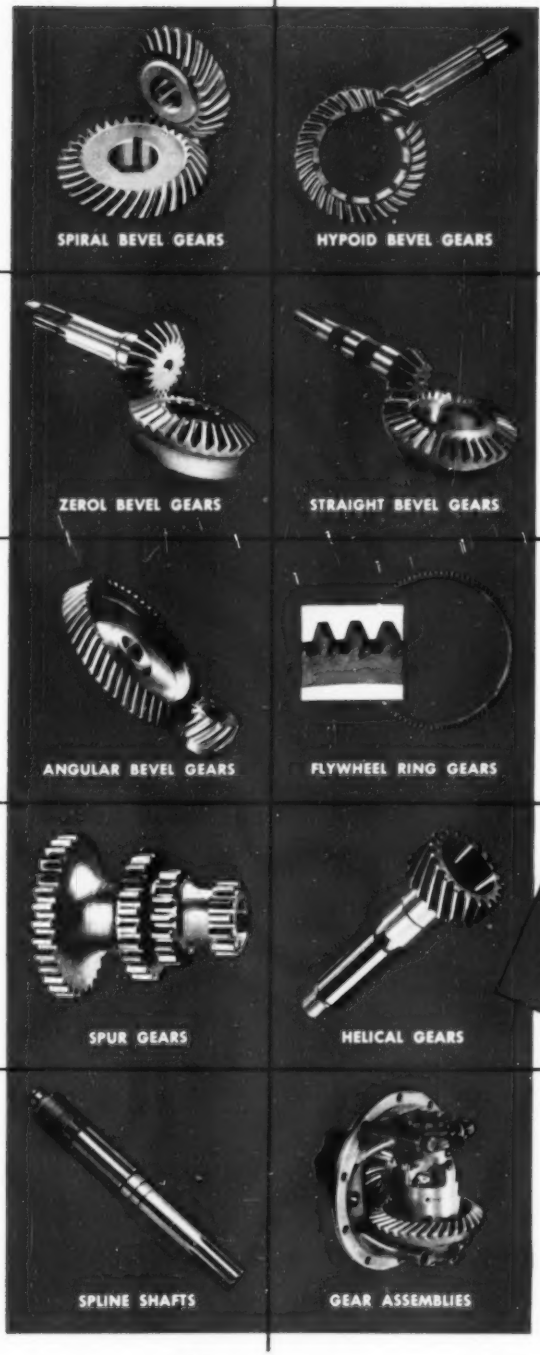
bay state taps

The perfect balance of precision and performance



BAY STATE TAP & DIE COMPANY, MANSFIELD, MASS.

ON NEARBY SHELVES OF INDUSTRIAL SUPPLY DISTRIBUTORS



Through 35 years of gear making, these are the 10 gear types that have emerged as our specialties.

If one (or more) of these types is included in your product, it may pay you to review the facts about Double Diamond Gears contained in this new book.

We will be happy to send you a copy. Why not write for one today?

DOUBLE DIAMOND
TRADE MARK
GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT & GENERAL INDUSTRIAL APPLICATIONS

AUTOMOTIVE GEAR WORKS

RICHMOND, INDIANA

How $25. and a DAKE Press

saved $1,200 worth of bushings from going to the scrap heap!

● *Close-up shows bushing being pressed through shrinking die*

Through a purchasing error, a manufacturer ordered 286 cylindrical bronze bushings .002" oversize—both inside and outside diameter. Since each bushing cost about $4.50, it would have meant a loss of more than $1,200 to scrap them.

So the manufacturer called in a machinist who works wonders with his Dake Hydraulic Press. Together, they figured that by building a tapered die and pressing the bushings through, it might be possible to shrink the bushings the necessary .002" both I. D. and O. D.

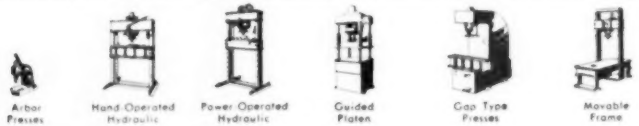
The die was made, and the pressing job was so successful that all but two or three of the bushings were salvaged. The die required about four hours to make, and pressing time was another four hours. Total cost of the job—eight hours labor and a small amount for material—less than $25.

The accurate operation of Dake Hydraulic Presses recommends them for scores of production, maintenance, and salvage operations. Do you have this versatile equipment?... are you using it to best advantage? . . . see your Dake distributor.

Write for this Catalog

Dake Engine Company, 602 Seventh St., Grand Haven, Mich.

DAKE PRESSES



HELLER

NUCUT WAVY TEETH FILE

GOOD TOOLS SINCE 1876

WITH A NUCUT YOU FILE MORE, FASTER, BETTER WITH LESS EFFORT

At every stroke of a NUCUT, you get *two* filing actions. One — a clean, true shearing that removes more metal without scraping or chatter. The other — a smoothing action that leaves the surface sleek, mirror-like.

Both are made possible by the superior cutting power of NUCUT'S *two* sets of teeth — coarse and fine. These are scientifically aligned in an exclusive wavy pattern you can readily detect when you observe a NUCUT at an angle.

To reduce your filing costs, ask your distributor for NUCUTS.

HELLER BROTHERS COMPANY

A New Jersey Corporation
America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO

How to protect files

A file is a cutting tool. To give you its best service, it must be carefully handled and safely stored.

WRONG: Throwing files together or with other tools results in dull or broken teeth.

RIGHT: Keep files separated. You can do this easily by hanging files in racks . . . or placing them in wood partitions. Either way affords good protection.

CONTACT YOUR INDUSTRIAL DISTRIBUTOR for our FULL LINE of American Pattern, Swiss Pattern, Milled Curved-Tooth and Rotary Files, Rasps, Machinists' and Carpenters' Hammers, Blacksmiths' and Farriers' Tools, Bricklayers' and Plasterers' Trowels, Craftmaster Scrapers, Chisels, Punches, Masterenches and other quality tools.

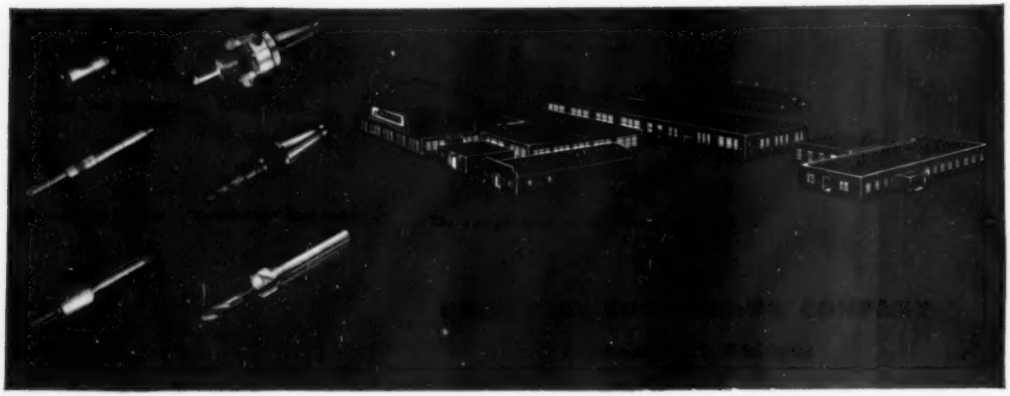
COMPLETE VARIETY OF

SIZES AND LENGTHS IN

UNIVERSAL SUPER FINISHED

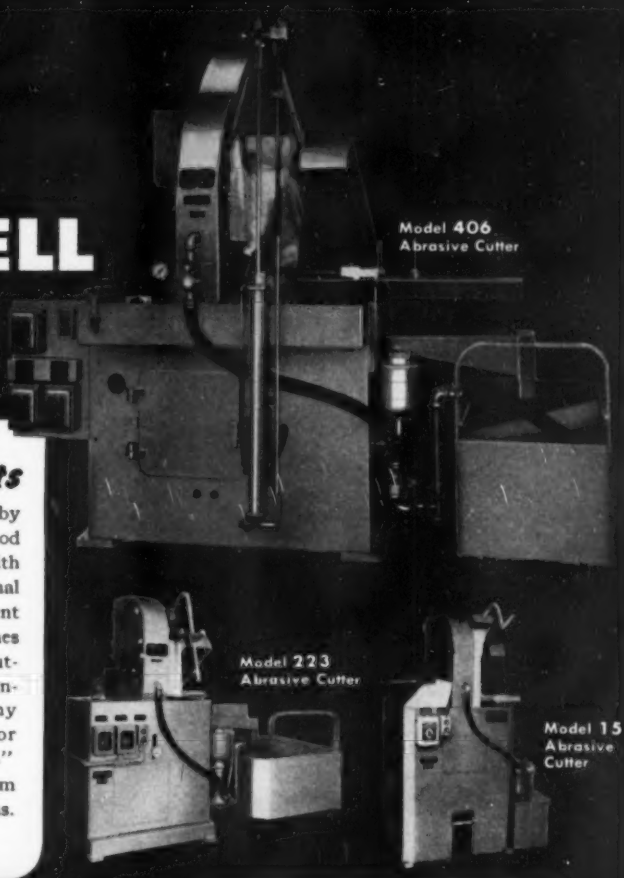
DRILL BUSHINGS

Check these features that make Universal drill bushings outstanding: 1. Super finish reduces wear to a minimum. 2. Blended radius reduces tool hang up. 3. 100% concentricity and hardness tests assure accuracy. 4. Knurled head provides quick sure grip. Order from the office nearest you ... 1060 Broad St., Newark, N.J., 5035 Sixth Ave., Kenosha, Wis., or write direct to our home office.



an **ACCO** product

CAMPBELL ABRASIVE CUTTERS



Fast, Low Cost Cuts

● Cutting any type of material by the CAMPBELL Abrasive method produces high quality parts with excellent finish and dimensional accuracy, often saving subsequent operations. CAMPBELL machines control heat in both work and cutting wheel. Wheel is entirely enclosed in safety guard. Many models are available. Ask for "*Principles of Abrasive Cutting.*"

Tell us your cutting problem and we'll make recommendations.

and CAMPBELL NIBBLERS

● The modern way to cut sheet metal to any desired shape. High speed, variable stroke. Quick and inexpensive. Literature will be sent on request.

ACCO

TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

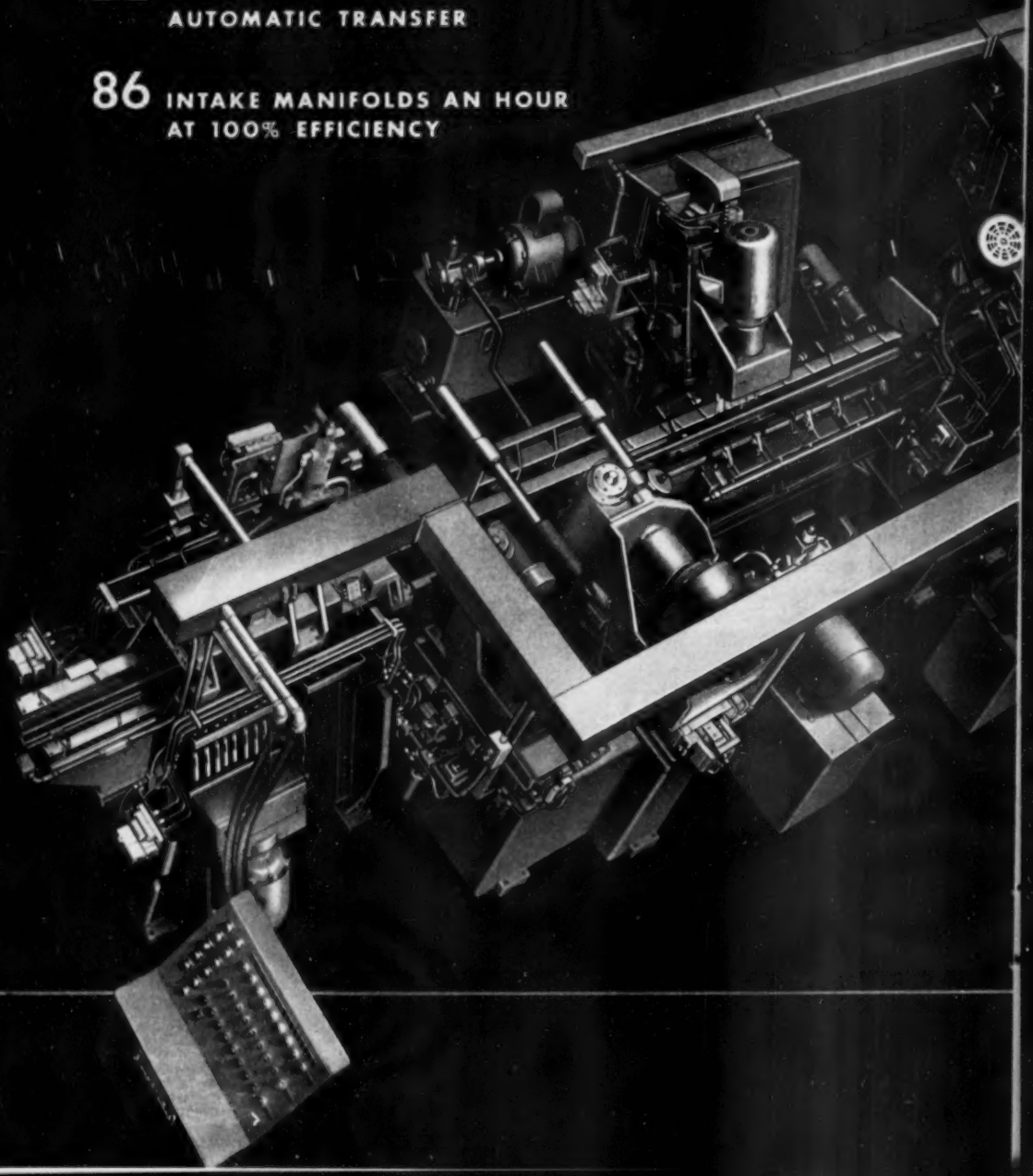
923 Connecticut Ave., Bridgeport 2, Conn.

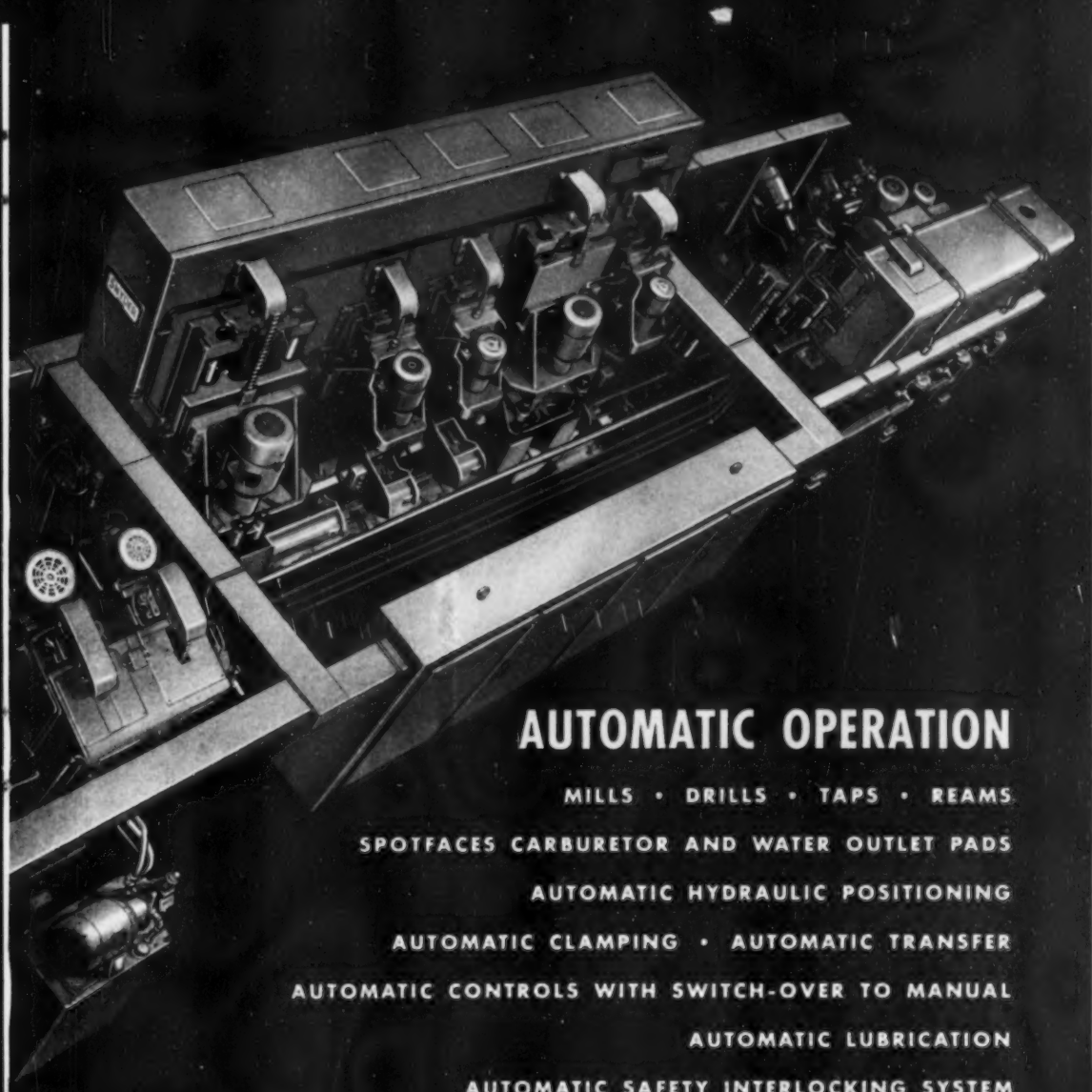
CAMPBELL
Abrasive Cutters and Nibblers

SNYDER MACHINES CONTROL COSTS

22 STATION
AUTOMATIC TRANSFER

86 INTAKE MANIFOLDS AN HOUR
AT 100% EFFICIENCY





AUTOMATIC OPERATION

MILLS • DRILLS • TAPS • REAMS

SPOTFACES CARBURETOR AND WATER OUTLET PADS

AUTOMATIC HYDRAULIC POSITIONING

AUTOMATIC CLAMPING • AUTOMATIC TRANSFER

AUTOMATIC CONTROLS WITH SWITCH-OVER TO MANUAL

AUTOMATIC LUBRICATION

AUTOMATIC SAFETY INTERLOCKING SYSTEM

SKILLED OPERATORS NOT NEEDED

SNYDER

TOOL & ENGINEERING COMPANY

3400
E. LAFAYETTE

DETROIT 7,
MICHIGAN

26 Years of Successful Cooperation with Leading American Industries

TOOLING COSTS CUT 60%

with an ALLITE* DIE

Here is an example of how Allite Dies show worthwhile savings.

A truck manufacturer required approximately 100 experimental roof panels. A three-piece Allite Die was built for the job. This die cost only 40% of what would have been required if an iron die had been used. Of equal importance to the customer, a zinc alloy die such as this is produced quickly, and its accuracy provides the true die conditions and performance that are usual in high production tooling. While nearly 100 stampings were drawn with this particular die, several thousand more could have been produced before any appreciable wear resulted.

If you have need for experimental or short-run dies, it can be to your advantage to give serious consideration to Allite Dies—produced by Richard Brothers Division where plaster pattern, modern foundry, and extensive die shop facilities are fully coordinated. Why not write today for full information.

*ALLITE DIES are accurately cast for low cost tooling. The material used is any formula of zinc alloy (Kirksite, Formaloy, etc.) which meets your requirements.

Other Allied Products

HARDENED AND PRECISION GROUND PARTS • SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES R-B INTERCHANGEABLE PUNCHES AND DIES

ALLIED PRODUCTS — PRECISION · EXPERIENCE · DEPENDABILITY

ALLIED PRODUCTS CORPORATION

DEPT. D-8 • 12605 BURT ROAD • DETROIT 23, MICH.

PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hilladale, Mich.

PLANT 4
Hilladale, Mich.

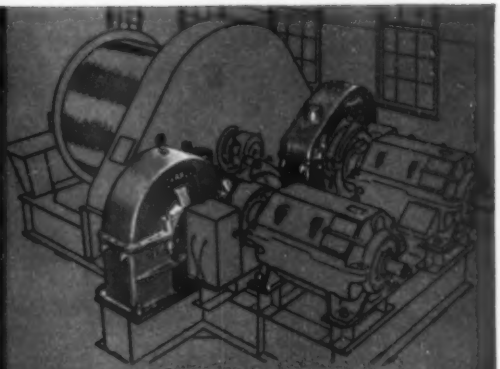
WHAT THE

Design Flexibility

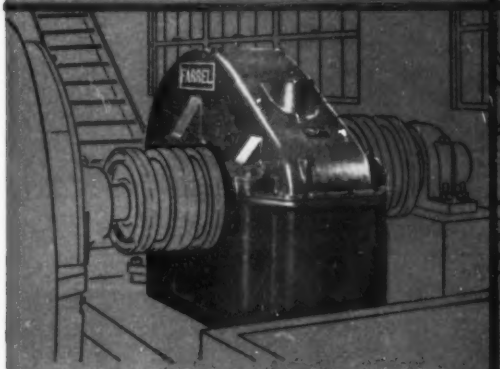
OF

FARREL® SPEED REDUCERS

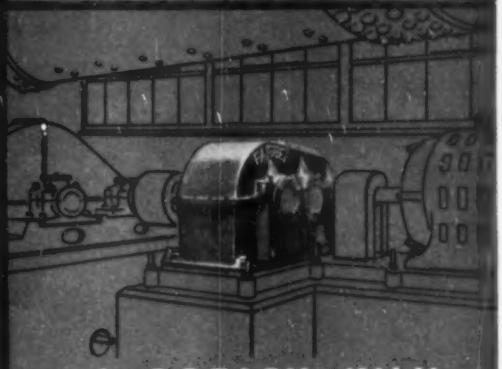
MEANS TO...



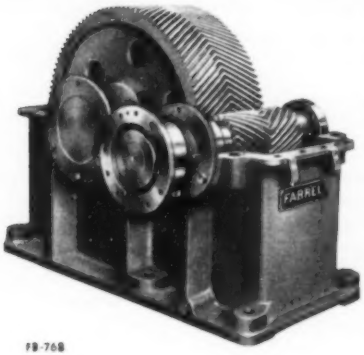
...A SKIP HOIST



...A ROLLING MILL



...A ROTARY KILN



FB-76B

Design flexibility means the same thing in each of these applications: *a speed reducer that meets the drive requirements exactly.*

Farrel speed reducers, unlike most "standardized" products, are standard only in their principal features. They are adaptable in critical detail. Gears, shafts, bearings, and even some housing dimensions, can be proportioned to meet specific load, speed and service requirements. This flexibility has resulted in the solution of innumerable application problems.

In addition to this feature, Farrel speed reducers have a number of other advantages. The quiet, vibration-free performance of the herringbone gears results from extreme accuracy of tooth spacing, contour and helix angle . . . qualities inherent in the Farrel-Sykes method of gear generation. Precision manufacture and highest grade materials contribute to long gear life.

Shafts and bearings are factored to safeguard against interruption of vital processes. Gear cases are proportioned to withstand repeated heavy peak loads. Joints are sealed to prevent entrance of dirt.

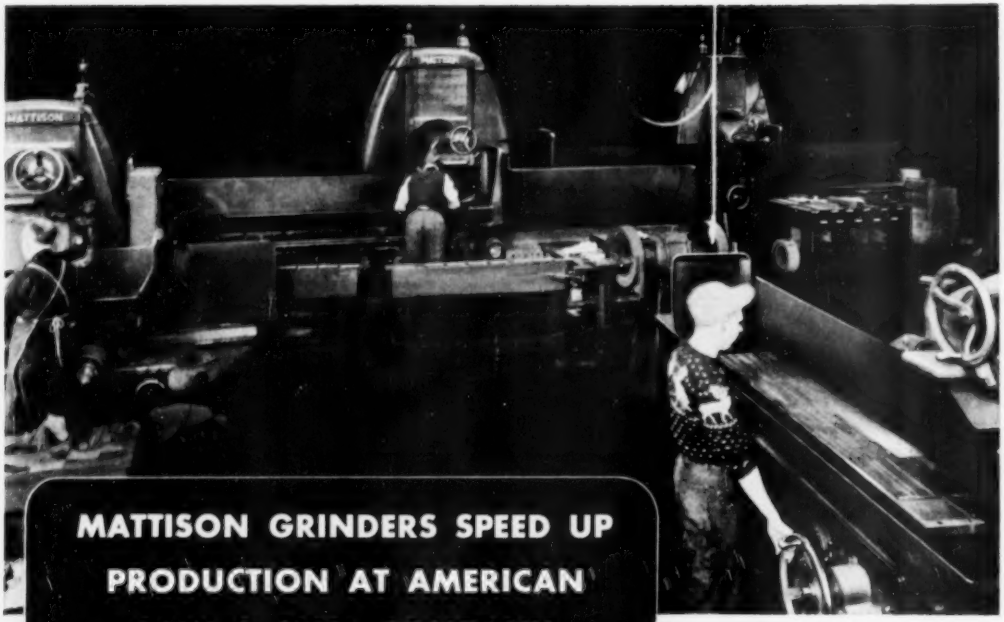
Write for further details of these problem-solving units. Ask for a copy of Bulletin 449.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONNECTICUT

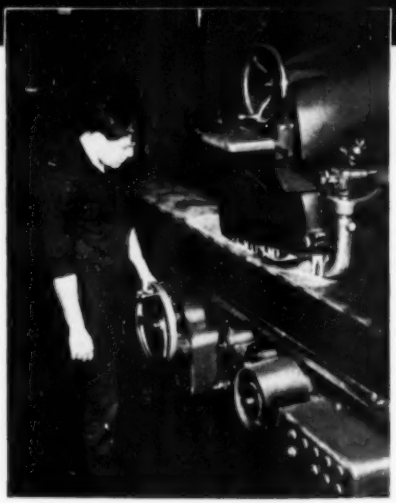
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

Farrel-Birmingham®



MATTISON GRINDERS SPEED UP PRODUCTION AT AMERICAN SAW & MFG. COMPANY

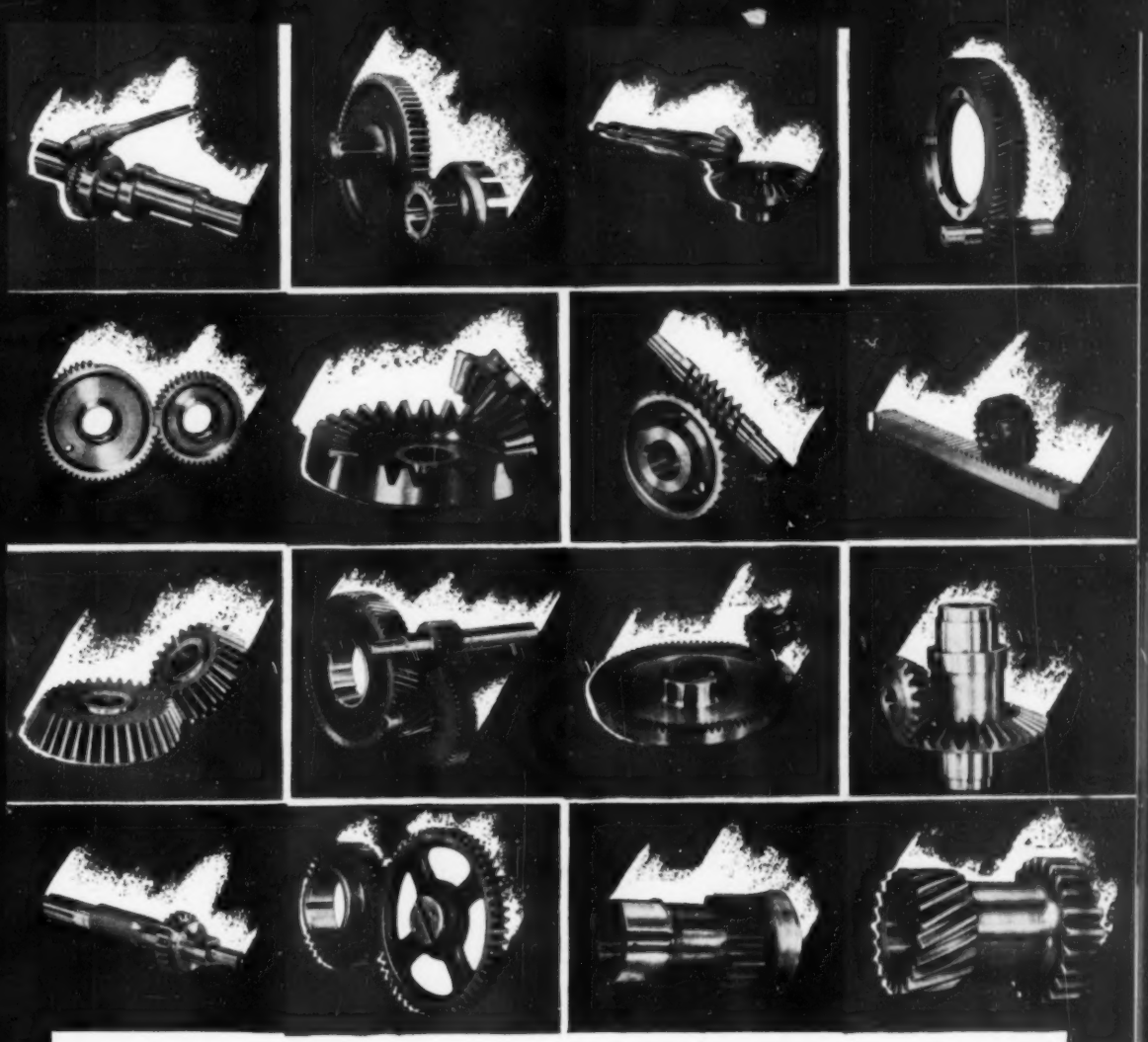


● The four Mattison High Powered Precision Surface Grinders shown above are used by American Saw & Mfg. Company for the grinding of annealed tool steel strips and bars on a real production basis in the manufacture of Lenox Precision-Master Ground Flat Stock. Exacting manufacturing specifications demand excellent finishes within close limits of accuracy.

The massive double column support, high power and rigidity of construction of the Mattison Grinder combine with accuracy and speed of operation to insure consistent precision results on a high production basis for American Saw & Mfg. Company. For complete information regarding the capabilities of the Mattison High Powered Precision Surface Grinder send for free circular.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS



IT'S YOUR MOVE...

You furnish the orders
We furnish the gears

1. **Absolute Quality** — you can depend upon every Illinois Gear to meet your specifications for accuracy and finish.

2. **Emergency Service** — Illinois Gear is prepared to work on your order 24 hours a day, 7 days a week if you are "on the spot" for gears.

3. **On Time Delivery** — you can rely completely upon Illinois Gear to meet delivery promises. No "if's, and's or but's."

Gears for Every Purpose

For one gear or 10,000 gears, write, wire or phone:

ILLINOIS GEAR & MACHINE COMPANY

Put 'em on a diet . . . with Pure Oil Industrial Lubricants

In the complete line of high-quality industrial lubricants Pure Oil makes, you will find many oils and greases designed to do several *different* jobs, instead of one specific job.

And to do each job *equally well*.

This makes it possible for you to do *all* your lubricating with *fewer* lubricants. In other words, you can

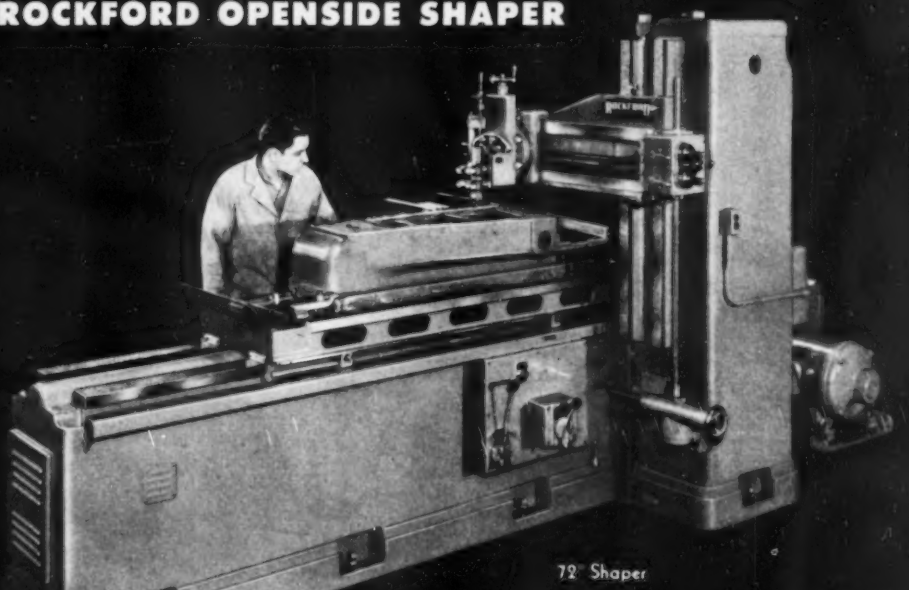
simplify and save . . . with Pure Oil Industrial Lubricants

If you would like to keep your lubrication requirements from hogging your profits (and a penny saved is more than ever a penny earned, these days!) write: The Pure Oil Company, Industrial Sales, 35 E. Wacker Drive, Chicago 1, Illinois.

THE PURE OIL PURE COMPANY, U.S.A.

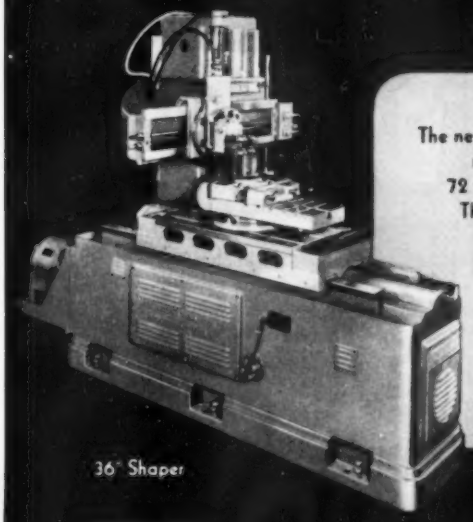
Be sure with Pure

ROCKFORD OPENSIDE SHAPER



72" Shaper

OFFERS *Speed* AND *Accuracy* PLUS *Versatility*



36" Shaper

The new 72" Rockford Openside Shaper gives you best results on *all* shaper jobs — with stroke lengths up to 72 inches.

This "big brother" of the Rockford Openside Shaper family (36", 48", 60", 72") has all the superior features of companion models, *plus* increased capacity. It's the maximum in versatility — large-job capacity with no sacrifice in speed or accuracy. And it's *Hydraulic* . . . of course.

Before you invest, investigate the new 72" Rockford Openside.

Hy-Draulic

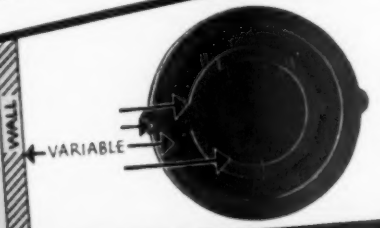
2500 Kishwaukee Street • Rockford, Illinois

SURE CURE

SQUARE D's MATCHING KNOCKOUTS

for faster, easier, neater GANGING
...no time-consuming conduit bending
—an *EXCLUSIVE* feature of *Square D* safety switches—
circuit breakers—starters—contactors—auxiliary gutters

Bending conduit is a familiar scene when electrical devices of varying sizes and makes are being connected. This costly operation can't be avoided if conventional concentric knockouts are used. The sketches show why.



WITH CONVENTIONAL CONCENTRIC KNOCKOUTS BENDING IS A "MUST"

Conventional concentric arrangement provides knockouts of various sizes, grouped around a common center, which must be positioned far enough from the rear of the enclosure to permit installation of the largest conduit size. Therefore, the distance from the rear of the enclosure to the edge of the knockouts is variable, depending on the combination of knockouts in each cluster. The size of the cluster required changes with device rating.

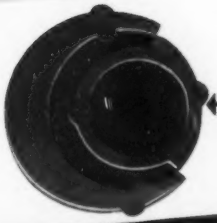
Expensive—Unattractive!

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

for the "BENDS"

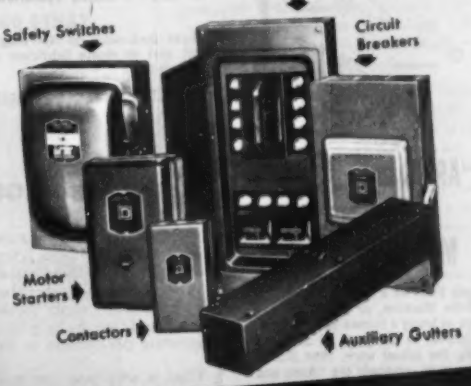


WITH MATCHING TANGENT KNOCKOUTS —STRAIGHT, NEAT CONNECTIONS

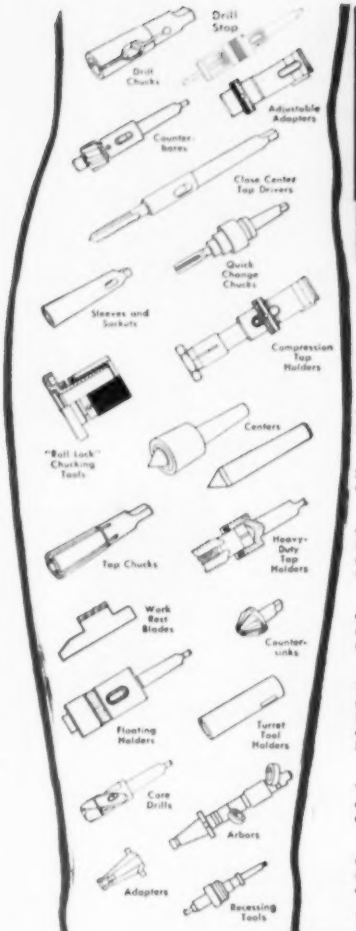
Square D's new tangent arrangement provides ½"-¾" concentric knockouts with larger knockouts in a tangent pattern. The edges of the two smaller knockouts are a constant distance from the rear of the enclosure. This automatically positions the tangent pattern, thus insuring matching knockouts regardless of size of cluster or device rating.

Economical—Attractive!

More good reasons for specifying Square D's electrical distribution and control equipment, straight across the board—less expensive to install and more attractive in appearance.

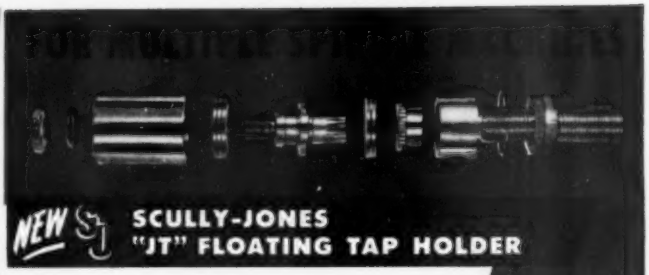


ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS



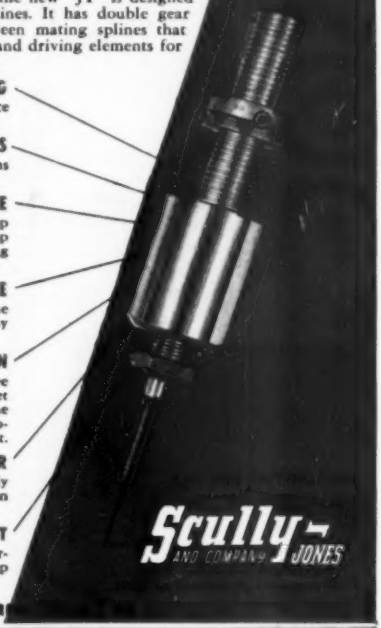
the "ARMS and HANDS" for your MACHINE TOOLS

If you think of a Lathe, Mill, Multi-Spindle Machine, or other Machine Tools as being a human body, supplying power to the parts of the body doing the actual work, then Scully-Jones tools represent the "Arms and Hands"



NEW SJ SCULLY-JONES "JT" FLOATING TAP HOLDER

Comparable to the "JA" Floating Holder, which has thoroughly proven itself in the field, the new "JT" is designed for use in multiple spindle machines. It has double gear spline drive, with clearance between mating splines that allows free movement of floating and driving elements for uniform tapping operations.



LESS OVERHANG
The short projection requires less space between spindle and work.

WORK ON CLOSE CENTERS
Small body diameter permits operations on close centers.

REDUCES TAP DAMAGE
Collet is split on 4 sides; centers tap by the shank, reducing strain and tap damage. Thrust bearings permit cutting tools to float freely into alignment.

SHORTENS SET-UP TIME
Quick-Lock Nut Locks any place on the threaded adapter shank, making it easy to adjust for depth.

TROUBLE-FREE OPERATION
Balls, in the 2 thrust bearings, are free to move or rotate around the collet because they are separated from the drive. This reduces destructive scrubbing action which prevents free float.

REDUCES WEAR
Wear of floating elements is practically eliminated, due to positive lubrication of all parts during operation.

SHUTS OUT DIRT
Outer shell with its "O" ring is a perfect seal to retain lubricant and keep out chips and dirt.

YOU GET LOW COST, FAST, ACCURATE PR

Scully-Jones AND COMPANY

YOUR PROBLEMS ARE OUR PROBLEMS

Helping you solve your tooling and production problems is Scully-Jones first objective. Ever since 1912 we have designed, developed and manufactured tools to the highest standards to help you get fast, accurate production at low cost.

That is why you can purchase S-J Tools and get the best that engineering research, modern equipment, correct materials and expert workmanship can produce.

Use these S-J "Arms and Hands" to equip your machine tools. They will help you get low cost, fast, accurate production on such operations as drilling, reaming, tapping, milling, counterboring, countersinking, core drilling, recessing or undercutting, boring and grinding.

For current information on S-J Tools, refer to Catalog 600. Write on your company letterhead for your copy.

Let us help you solve your tooling and production problems. Because our manufacturing facilities have been expanded, we're in a position to give you reasonable deliveries. For quick service see our nearest representative or contact Scully-Jones direct.

ARE YOU GETTING ALL THESE BENEFITS FROM YOUR CUTTING FLUID?

....LUBRICITY
to withstand pressure and reduce friction

....VERSATILITY
one cutting fluid to do 90% of all jobs

...ANTISEPTIC PROPERTIES
no skin sores, no rancid odors

...FILM STRENGTH
which gives you longer tool life

....COOLER WORK
which can be handled bare-handed

....LOWER COSTS
less than 8¢ a gal., in the machine

YOU GET THEM ALL WITH

ANTISEP

ALL-PURPOSE BASE

—not a mere water soluble oil, but a fortified concentrate scientifically developed to give you "100 oils in one!"

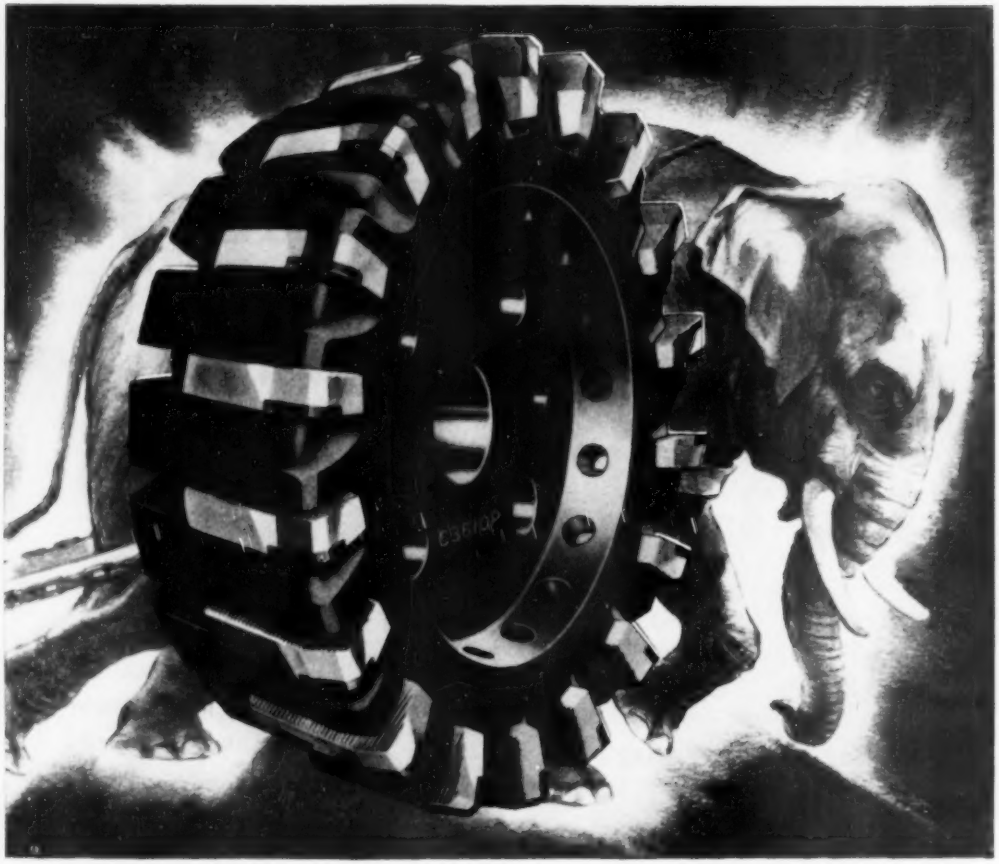
ANTISEP doubles tool life for Portland manufacturer —at 1/5 the cost of oil!

Operation consists of forming, threading and tapping stainless steel pipe nipples from 316, 340 and 303 type steel. This company switched from straight oil—costing 42¢ per gallon—to Antisep A.P. Base mixed one part to 30 with water—at a cost of about 8¢ per gallon.

LATEST REPORT—"Getting better finish—tool life doubled—at 1/5 the cost of oil formerly used." Their operators also like Antisep because there's no smoke and work comes off clean.

E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .



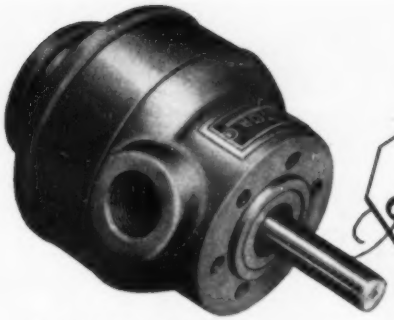
Pull...like a bull elephant

OK DUAL ADJUSTMENT milling cutters, size for size, are the huskiest produced. In simplicity lies their great strength. There are just two parts — body and blades . . . uncomplicated or weakened by cut-outs or recesses for locks, pins, gibs or gadgets. Bodies are drop-forged, with slots positioned to micrometer dimensions. Blades are available in high speed, alloys or carbide.

The drive-fit insures a secure seat. Mating serrations prevent blade movement except for advancement to compensate for wear. This simple construction permits the use of more blades in the fine pitch series and heavier blades in the coarse pitch series. OK cutters convert the full horsepower available without losing a kick, remove the maximum amount of metal — measured in speed, feed, chips, minutes, power consumption or man hours. **Do you have a copy of the OK catalog 13?**

modern milling cutters for modern milling machines

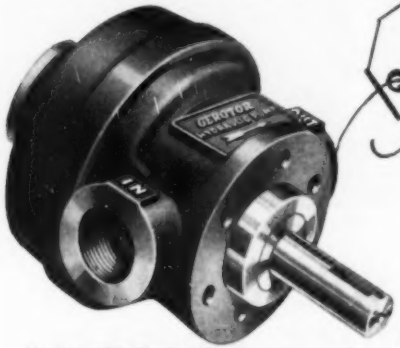
THE OK TOOL COMPANY, Milford, New Hampshire



IMMEDIATE DELIVERY

need pumps fast?

Series "QH" Hydraulic Pumps . . . 4 sizes, for continuous pressures up to 1200 p.s.i., intermittent to 1500. Deliveries from 3 to 12 g.p.m. at 1200 r.p.m.



IMMEDIATE DELIVERY

Series "B" Hydraulic Pumps . . . 3 sizes, for continuous pressures up to 1000 p.s.i. Deliveries from .4 to 1.5 g.p.m. at 1800 r.p.m.

IMMEDIATE DELIVERY

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GEROTOR MAY CORPORATION

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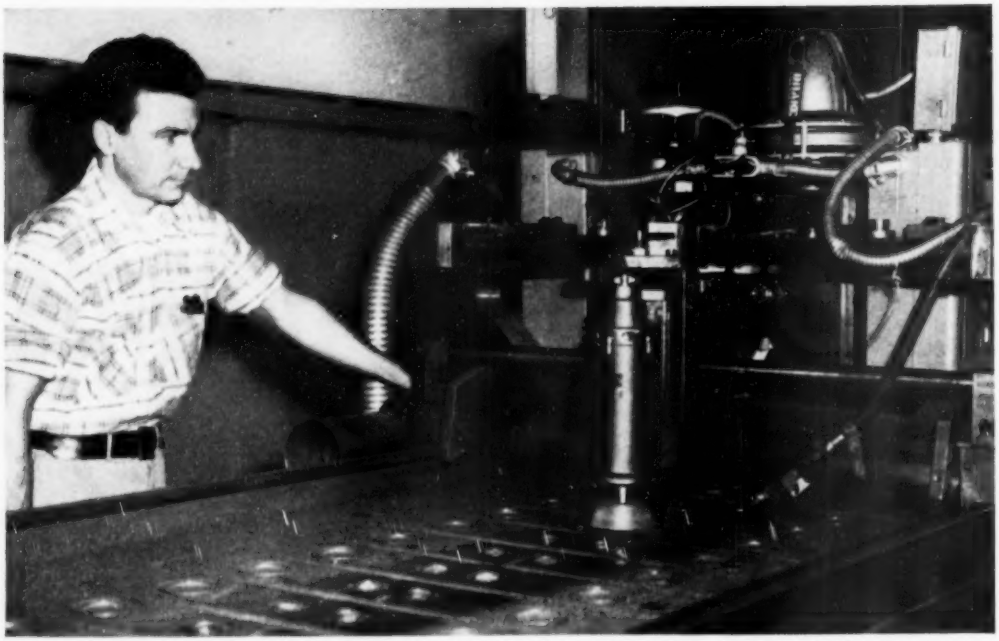


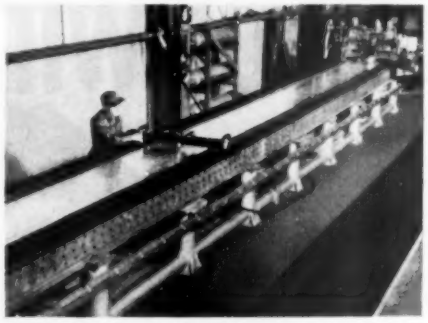
Small Wheel Does a Big Job. *Truing the 40 foot by 27½ inch bed of a wing spar cap shaping machine with a Robertson Grinding Wheel.*

ROBERTSON GRINDING WHEEL SOLVES A BIG PROBLEM FOR CHASE AIRCRAFT

It was an ingenious machine which Chase built for shaping wing spar caps for the C-123 Assault Transport—but it brought up a big problem. To precision-shape the caps to the contour required, the machine bed had to be perfectly flat. The bed was chilled cast iron, 40 feet long and $27\frac{1}{2}$ inches wide. Truing such a large surface by grinding couldn't be done—the experts said.

But a Robertson Wheel, driven by a 1 hp motor, proved the experts wrong. The job was done right . . . and on time. The wheel used was a standard Robertson 4 3 x $1\frac{1}{2}$ x $\frac{1}{2}$ Type 11. A small wheel for a big job. The average stock removed was .015 inch. True flatness of bed was achieved to an accuracy of .0025 inch.

It-couldn't-be-done jobs are everyday fare for Robertson Grinding Wheels. They're precision built for the toughest jobs industry has to face. Prove it yourself. Blueprint your problem and let us recommend a wheel that will solve it.



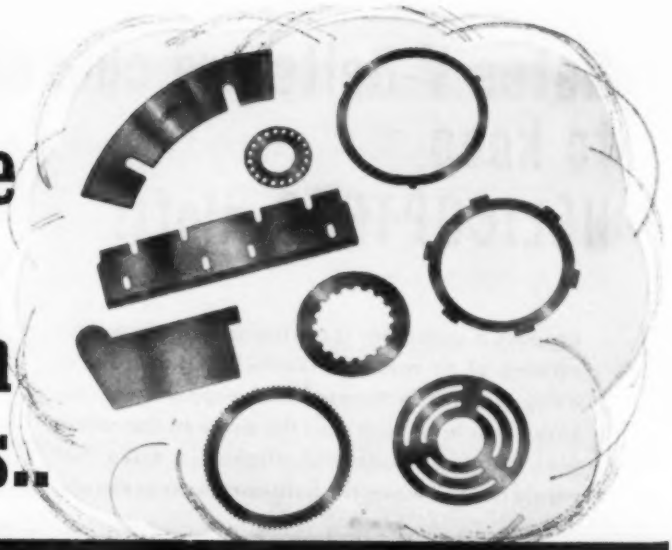
Accuracy is the Axiom for Aviation Products. *Checking the contour of a spar cap for accuracy.*

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

If Parts Like These are Production Headaches..



...then make SIMONDS Special Parts Division part of your own production line!

Heat Treated Discs — all types	Blades — All types — plain — toothed — beveled (For cutting or scraping)
Valve Discs (Compressors)	Circular Cutters for all types of cutting
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Aircraft Engine Discs	Heat Treated Liner Plates
Machine Parts (Flat Steel)	Rectangular Plates — All types
Wear Plates (Ways, etc.)	

If you're having difficulty manufacturing (or obtaining) any *FLAT STEEL PARTS* . . . especially parts that require heat treating and grinding . . . then here's your headache powder

Simonds Special Parts Division can be your production line for these parts . . . raw steel from Simonds Steel Mill in Lockport, N. Y., fabricated into your part at Simonds Famous Windowless Plant in Fitchburg, Mass.

Simonds Special Parts Division is fully equipped to produce precision parts for aircraft engines, printing presses, slitting machines, air compressors and numerous other applications. Clutch discs for coal handling equipment, machine tools, marine transmissions. etc., is another Special Parts Division item. Send your inquiries, with full specifications or blueprints, direct to Simonds Special Parts Division, Fitchburg, Massachusetts.

SIMONDS
SAW AND STEEL CO.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que. Southern Service Shop in Meridian, Miss. (formerly J. H. Miner Saw Mfg. Co.). Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

Gates V-Belts are chosen to keep HELICOPTERS aloft!

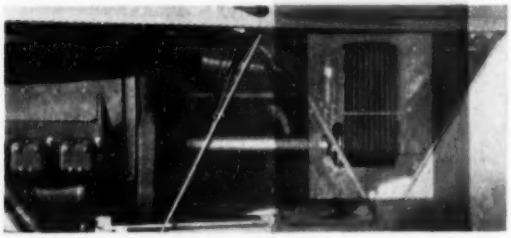
McCulloch Tandem-Rotor Helicopter

(Above) Two-place helicopter employs tandem-mounted, intermeshing rotors—a total of six rotor blades—powered by a 200-hp, six-cyl., aircooled horizontal engine installed at the rear. (Lower left) Gates-engineered V-BELTS, shown installed at the rear of the engine, transmit power from the engine to the main drive shaft which in turn drives the reduction gearing for the rotors.

Because a helicopter is air-borne entirely by the turning of its rotors, McCulloch Engineers who designed this helicopter and supply it to the Navy had to be sure that the drive to the rotors was, above all, safe and reliable—a drive that would not fail when the helicopter was in the air.

The special difficulty in designing this drive was the extreme *compactness* required.

On small diameter pulleys and short center distances, the drive must handle 200 horsepower for 1000 hours at cruising speed and 500 hours at high speed. Ordinarily, it would have been impossible to achieve these results.



A Notable Application of Gates SPECIALIZED Research

However, Gates had developed a V-Belt which in thousands of applications had proved to have the exact characteristics required for this helicopter drive—and Gates had also developed design data which showed at once the applicability of this belt.

It was not by accident, therefore, that Gates Engineers were at once prepared to supply a V-Belt capable of handling this most exacting assignment and—in close co-operation with McCulloch Engineers—they developed the drive shown which has most successfully met all requirements.

Gates readiness to meet successfully *any* V-Belt Drive assignment is possible because Gates runs an *average* of 32,000 hours of testing *every week* on V-Belts alone! (32,000 hours is equivalent to *five years* of life for one belt.)

And the real value to you of such exhaustive testing is this: Laboratory findings are carefully checked by tests made under actual field conditions and the *results* are at once reduced to *usable data* for the design of V-Belt Drives to *perform whatever task may be required!*

Phone for a Gates Field Engineer

If you have a difficult drive to design, or if some drive in your plant is giving trouble, or if you only want to be sure what size and construction of V-Belts will give the most efficient and the lowest cost service on any particular drive—you have only to phone a Gates Field Engineer, *always near you* in all industrial centers.

Just look in your phone book under "Gates Rubber." A Gates Field Engineer will come right to your plant and put at your service the full benefits of Gates V-Belt knowledge and experience *without the slightest obligation!*

ENG-522

Gates VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY

DENVER, U. S. A.

The World's Largest Makers of V-Belts

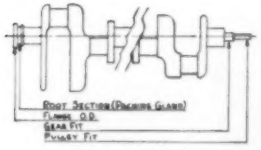
Salvage of rejects speeded by new metallizing alloy

outwears old bearing material 25 times

Automotive manufacturer replaces chrome plating installation with metallizing for salvage of mis-machined crankshafts; steps up output to 10 per hour

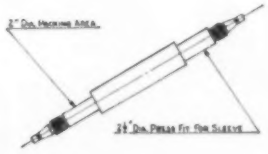
Sprabond Wire, the new self-bonding metallizing alloy, is speeding reject salvage in a wide range of production applications. It has been found particularly valuable in building up parts which have been machined undersize, or damaged by tool marks. Resulting surfaces are extremely hard and, due to their microscopic pore structure, tend to hold considerable amounts of oil. These factors produce excellent wear characteristics, some users reporting increases in service life as much as 25 times that obtained in any other way.

Application is simple and fast; only 3 operations: (1) the part is cleaned or undercut; (2) Sprabond Wire applied; (3) the surface finish-ground. Dovetailing and undercutting often not required and build-up can be carried to a feather edge. No danger of warpage because negligible heat is generated in the part during spraying.



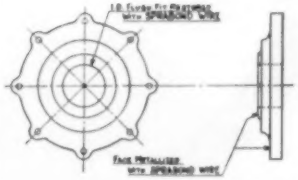
Better and faster than plating

Sketch shows automotive crankshaft of the type being reclaimed in quantity by large manufacturer. These parts were formerly reclaimed by plating, which was slow and expensive. With metallizing, however, production rate is 10 shafts per hour.



Where welding is impractical

Heat warping and consequent straightening costs made welding impractical for salvage of blower shafts such as shown above. Shafts formerly scrapped and replaced are now rebuilt. With Sprabond Wire metallizing, saving is $45.00 each.

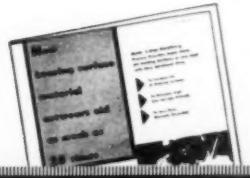


Fits restored—no re-machining

Press fit in electric motor end bell is frequently lost through wear. Welding is impractical here, too, because of warpage. But a few thousandths of Sprabond Wire on the I.D. builds a press fit so that even minimum grinding is often unnecessary. Savings per end bell—about $30.00.

Some other money-saving applications for the Sprabond Wire process

Cracked blocks and castings — flat surfaces — molds, patterns, match plates — sand holes thin sections — lathe ways—inside diameters — gas holes.



FREE BULLETIN Metco Bulletin 57B describes the advantages of the Sprabond Wire metallizing process in detail. Micro-photograph of Sprabond Wire coating on steel shows how it works. Use the coupon to send for your free copy today. No obligation, of course.

METALLIZING ENGINEERING CO., INC.
38-24 30TH STREET — LONG ISLAND CITY 1, N. Y.
In Great Britain: METALLIZING EQUIPMENT COMPANY LTD. Chobham near Woking, England

The following trade names are the property of Metallizing Engineering Co., Inc.: METCO*, SPRABOND WIRE. *Reg. U. S. Pat. Off.

R. J. McWaters
Metallizing Engineering Co., Inc.
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"Eternal Vigilance is the Price of Liberty" . . . these words, today, have a deep, personal meaning to every freedom loving American. And, again, the aircraft industry plays an important role in furnishing the "eyes" to keep this vigilance and the "muscle" to deliver a telling blow for freedom, if the need should arise.

In the aircraft industry, like most other businesses, unbiased preference for a particular product or machine tool is based on performance and a high regard by the purchaser for the manufacturer's ability to build top-quality equipment.

H-P-M is proud that the majority of giant hydraulic presses, ranging in size from 5000 tons to 7000 tons, purchased by the aircraft industry, are H-P-M Fastraverse Presses. And, H-P-M is truly grateful to the aircraft industry for this overwhelming vote of confidence in our company and the presses we produce.

Through continuing research and proper application of the knowledge we have gained through 75 years of specialized experience in our chosen field, hydraulics, we shall endeavor to remain . . . *first choice of the aircraft industry!*

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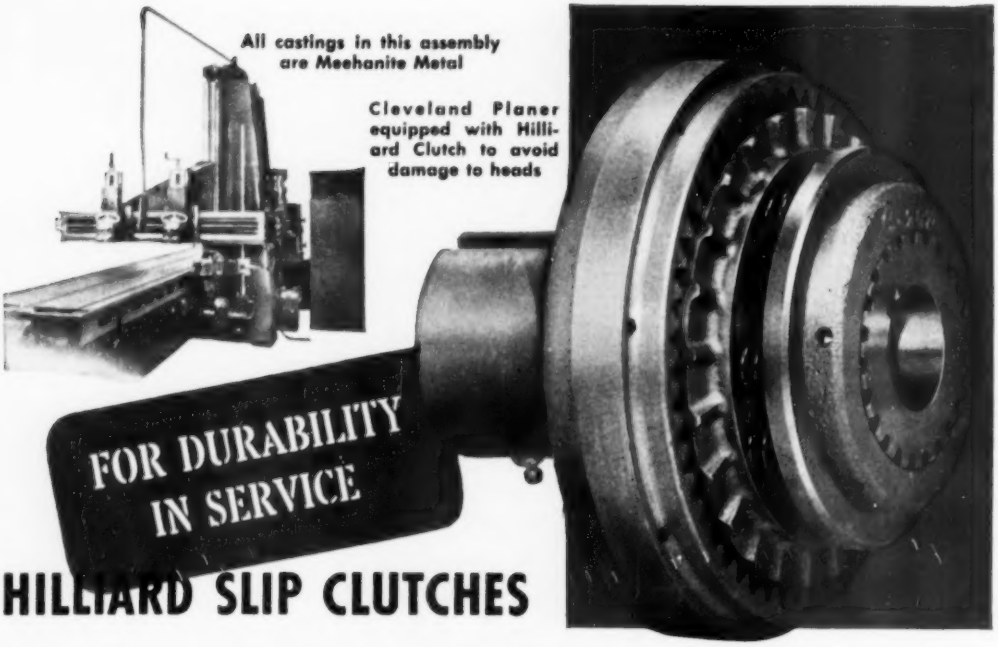
All castings in this assembly are Meehanite Metal
Cleveland Planer equipped with Hilliard Clutch to avoid damage to heads
FOR DURABILITY IN SERVICE

HILLIARD SLIP CLUTCHES

BUILT WITH MEEHANITE CASTINGS

The Hilliard Corporation—Elmira, New York, manufacture a line of all-purpose slip clutches (Fig. 1) for use in equipment requiring precise control of tension or power applied to a driven machine and in connection with safety devices and load limiting mechanisms. As an example, planers such as shown in Fig. 2 incorporate Hilliard clutches to protect the heads and crossrails against damage in case of obstruction.

Such clutches obviously require component castings which can provide without fail three definite characteristics—namely:

1. **High tensile strength**
2. **Resistance to heat deterioration**
3. **Maximum wearing qualities**

Hilliard designers specify Meehanite castings for all cast parts of this clutch on the basis of experience and the sure knowledge that these properties will be secured regularly.

In addition the use of Meehanite castings gives an assurance of uniformity, ready machinability, and a high freedom from casting defects. Thus production flows are steady and efficient and Quality of the product high.

For facts about how Meehanite castings can improve *your* product, reduce losses and speed production, write for Bulletin #35—"Meehanite Castings Serve All Industry".

Take *YOUR* Casting Problem To A MEEHANITE FOUNDRY

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Toledo, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
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Johnstone Foundries, Inc.	Grove City, Pennsylvania
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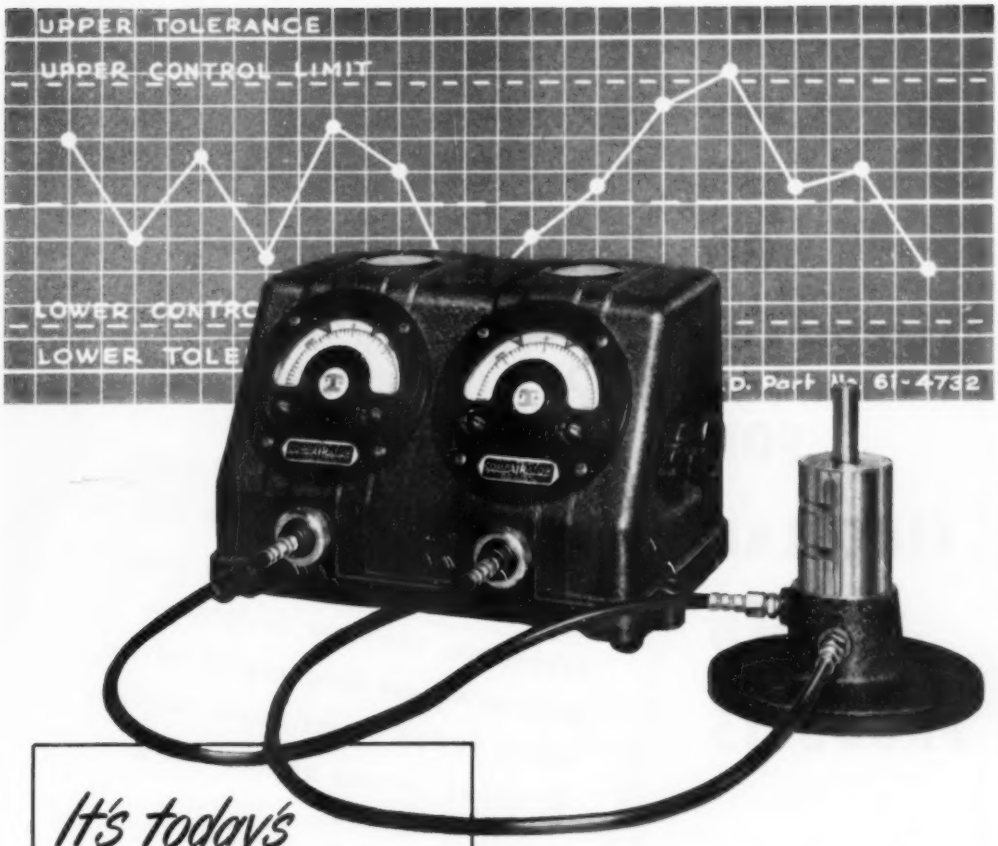
Pohlman Foundry Co., Inc.	Buffalo, New York
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
Shenango-Penn Mold Co.	Dover, Ohio
Sonith Industries, Inc.	Indianapolis, Ind.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey

"This advertisement sponsored by foundries listed above."

MEEHANITE® NEW ROCHELLE, N. Y.



It's today's most versatile Quality Control Tool

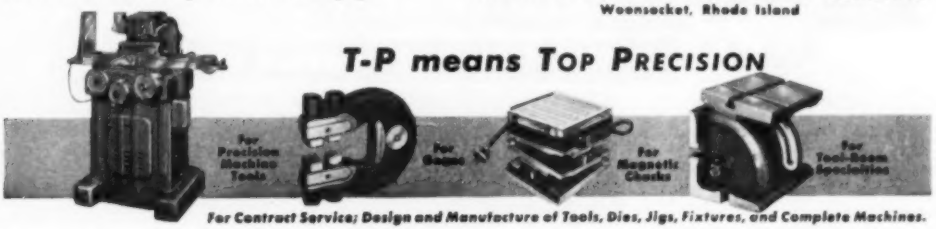
—the Taft-Peirce CompAIRator

For economical use of Statistical Quality Control, the ideal gage is a versatile one—a gage suited to *trouble-shooting* as well as to permanent installations. The Taft-Peirce CompAIRator *is* that gage!

The quick-lock arrangement permits easy and rapid changing of gaging members. Magnifications can be changed in a matter of minutes to provide scale ranges as wide as .008" in .0001" increments or as fine as .001" in .000025" increments.

It is a completely self-contained, easily portable unit, which can "take it" in the shop. Stand it on a machine — jars and vibrations do not affect accuracy! Use long extensions — response is still virtually instantaneous! Write today for Catalog 610.

THE TAFT-PEIRCE MANUFACTURING COMPANY
Woonsocket, Rhode Island



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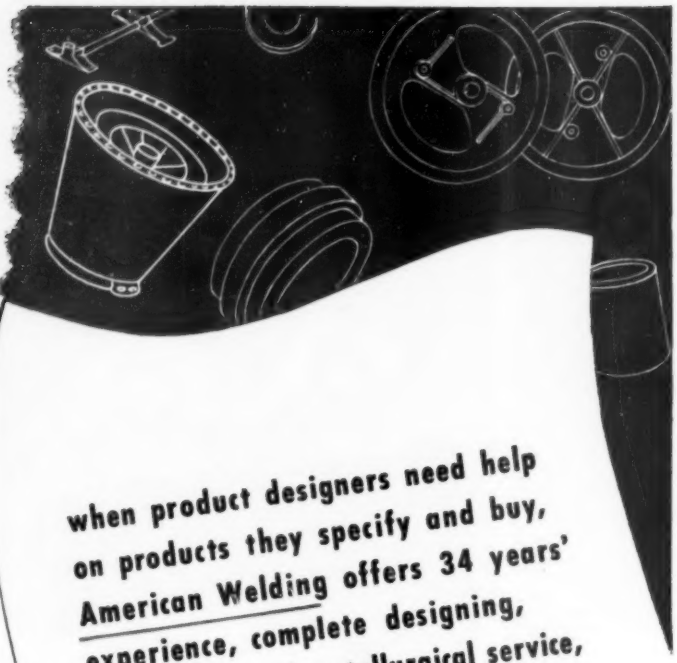

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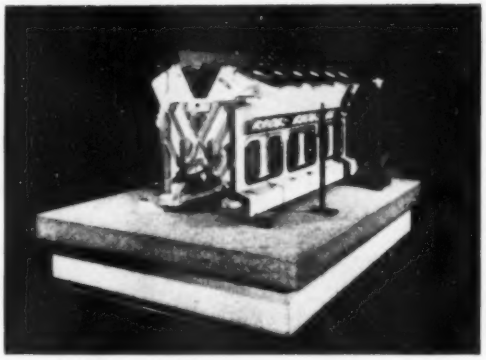

PINK GRANITE SURFACE PLATES

Precision — from start to finish — is the key to profitable mass production. In tool rooms, and on inspection and quality control operations, the absolute accuracy of Herman Stone granite surface plates insures permanent, profitable precision.

Take advantage of the much closer tolerances . . . the freedom from rust, warp and corrosion . . . the non-magnetic and temperature-resistant features . . . and the unmatched hardness of Herman Stone granite surface plates.

Cost? Herman Stone granite surface plates actually cost less today than in 1942 . . . most stock size plates are more economical than ordinary cast iron plates.

Delivery? Recent doubling of our specialized production facilities, devoted solely to the production of granite surface plates, T-bar plates and straight edges, assures prompt delivery — on many sizes, direct from stock.

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- **FREE TRIAL IN YOUR PLANT; SEE COUPON BELOW.**

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THE FIRST STEP . . . to lower quality control costs!

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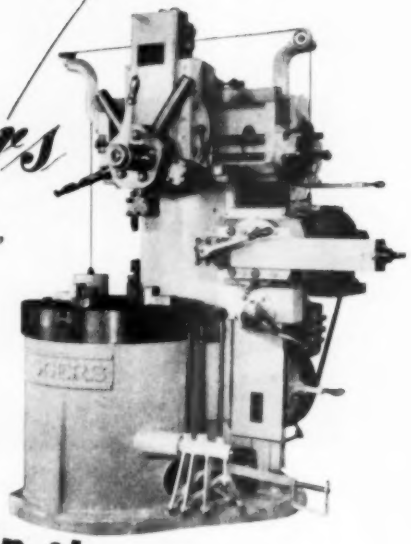

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Further proof of satisfactory performance is the high percentage of repeat orders from Rogers users throughout industry.

For the fourth time in the history of this 66 year old company, Rogers Mills are taking an important part in the defense of the United States.

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Knowing How Since 1885

NEW jet black PARCO BLACK

A corrosion resistant coating *from a single bath!*

Here's a new Parker product that produces a better black finish on iron and steel. Parco Black is jet black and durable, with about ten times the corrosion resistance of conventional blacks.

The Parco Black coating is chemically produced and is an integral part of the metal surface. It is not a dye.

Treatment with Parco Black is simple, safe and easy. Parts to be treated are immersed in the low-temperature, non-caustic processing solution from 15 to 30 minutes. After rinsing and drying, they are oiled or waxed and the durable deep black finish is ready for service.

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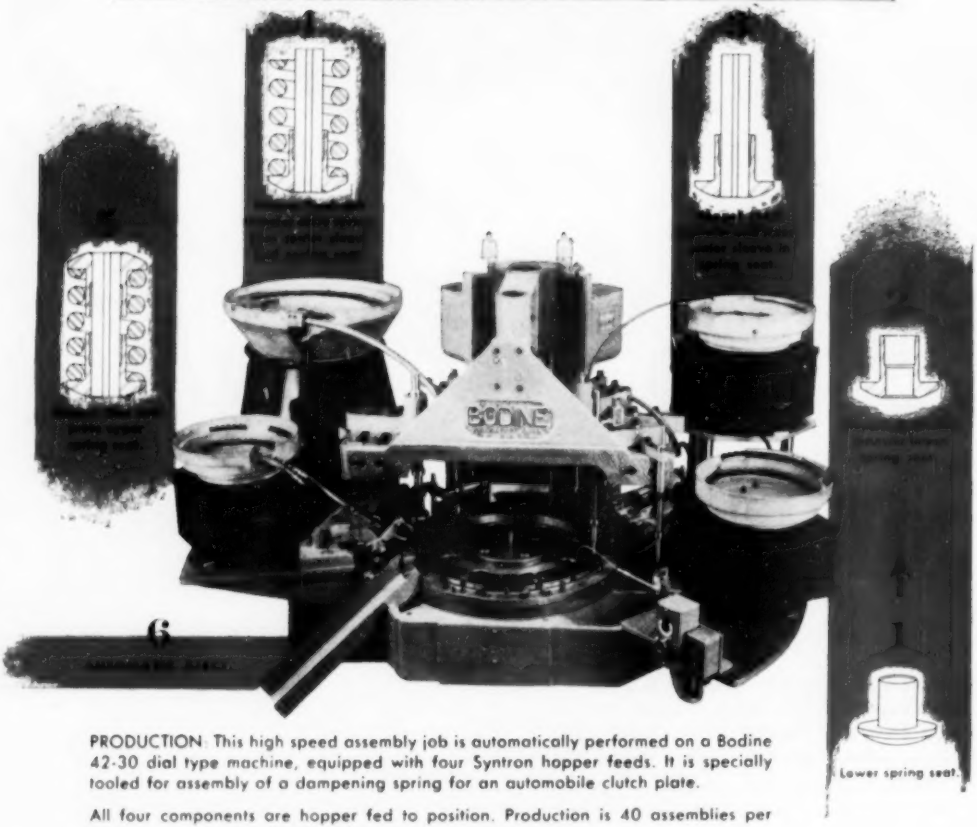
BONDERITE—corrosion resistant paint base • **BONDERITE and BONDERLUBE**—aids in cold forming of metals
PARCO COMPOUND—rust resistant • **PARCO LUBRITE**—wear resistant for friction surfaces

Bodine CASE HISTORY NO. 33

Bodine ASSEMBLES A DAMPENING SPRING *AUTOMATICALLY*



PRODUCTION: This high speed assembly job is automatically performed on a Bodine 42-30 dial type machine, equipped with four Syntron hopper feeds. It is specially tooled for assembly of a dampening spring for an automobile clutch plate.

All four components are hopper fed to position. Production is 40 assemblies per minute . . . automatically ejected.

Bodine engineers can solve your problems for repetitive production of small parts . . . milling, drilling, tapping or assembly, automatically . . . at low cost. Write us!

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LOCAL AVAILABILITY... There is a Lincoln Distributor located in all principal cities throughout the world.

LOCAL EQUIPMENT SERVICE... Avoid the loss of production time. Your Lincoln Distributor has mechanics, factory-trained in the Lincoln Service School. He carries a complete stock of genuine Lincoln parts.

LOCAL ENGINEERING SERVICE... Lincoln Distributor Salesmen are trained to make expert recommendations to meet your lubricant application requirements.

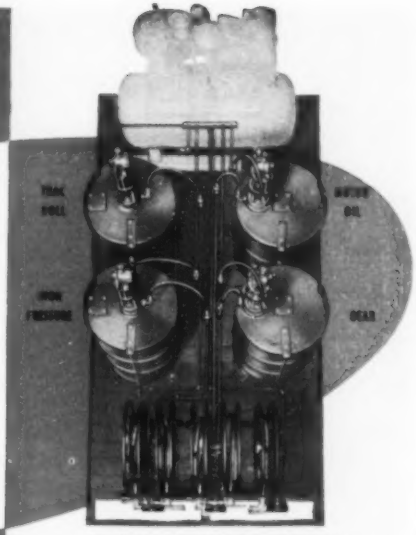
NATIONAL UNIFORM PRICING... All Lincoln Distributors operate under the same policy of sales and service policy.

Save Man-Hours . . . Reduce Maintenance Costs in the Field With Lincoln Engineered Lubricating Equipment

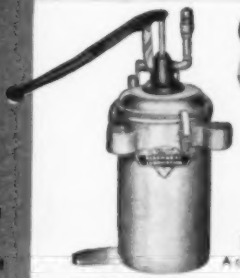
Write for your copy of booklet telling how the George M. Brewster and Son Company, contractors of Bogota, N. J., practice maintenance on-the-job with Lincoln mobile lubrication units.

*Trademark Registered

LINCOLN ENGINEERING COMPANY
5754 Natural Bridge Avenue St. Louis 20, Missouri



LINCOLN STANDARD LUBROVANS*
Complete • Compact • Portable
Lincoln Portable Lubrovans, for on-the-job service, reduce lubrication time to a minimum and make it possible to keep equipment properly serviced, thereby avoiding costly breakdowns, wear and loss of productive time.



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Surface Check Grease Fittings
The modern fitting that Seals Dirt Out - Grease In.

BUTTON HEAD FITTINGS
A complete range of thread sizes

FILLER PUMPS Refills Grease Guns in Seconds.

HIGH-PRESSURE GREASE GUNS

Model 1035

Model 1035 . . . Heavy duty lever gun.

Model 1143 . . . High pressure utility lever gun.

***You Profit* When You "Buy It from Your Distributor" Consult Him for Lincoln Lubricating Equipment.**

• • • PIONEER BUILDERS
LINCOLN
LUBRICATING EQUIPMENT • • •

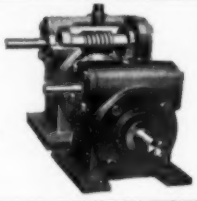
Dust? . . . dirt? . . . vibration? . . . sudden load changes? . . . 24-hour operation?

It takes a *good* gear to stand up under the tough punishment found in industry today. And Grant — thanks to over 70 years of experience — makes *only* good gears. So when you're faced with a really tough gear problem — call on Grant for a fast, economical solution.

Grant Gears are made in standard and custom types from ¼" to 72" in diameter. Hundreds carried in stock at all times. Send prints or specifications for quick quotation.

Look to Grant
for *gear units*, too . . .

. . . hundreds of types and sizes available from stock — write for bulletin



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75th ANNIVERSARY

169 W. Second St.
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GEARS
To Your Specifications
Over one hundred major machine tools plus our twenty-five years continuous gear production for aircraft and industrial fields are at your service.
Your inquiry is invited
ACME GEAR COMPANY
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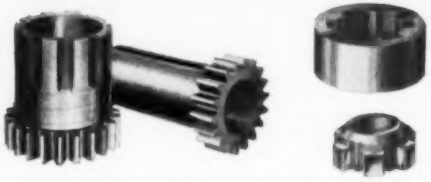
MADE WITH PRECISION— SOLD WITH CONFIDENCE



Each gear order we receive, no matter what the specifications or quantity, gets our very closest attention. Each step of gear manufacture is carefully controlled to assure lasting service and satisfaction. THE ADAMS COMPANY, 1942 Cypress Street, Dubuque, Iowa.

the ADAMS line . . .

SPUR GEARS	INTERNAL GEARS (Spur and Helical)	SHAVED TOOTH GEARS (Spur and Helical)
BEVEL AND MITER GEARS	RATCHETS	GROUND THREAD WORMS
WORMS AND WORM GEARS	SPLINED SHAFTS	RACKS
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The ADAMS Compa
Dubuque, Iowa, U. S. A.
ESTABLISHED 1883

GEARS

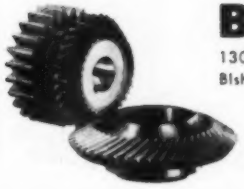
FINE GEARS MADE TO YOUR SPECIFICATIONS

above • Looking down inside you see gears ready for shot-peening and spiral conveyor which returns used shot

right • Front view with lid raised showing other gears to be shot-peened

Shot-Peening is a method of toughening gears to make them wear longer. BRAD FOOTE'S shot-peening machine, one of the largest ever made, bombards the gear with shot under pressure. As each shot strikes it compacts the metal and hardens a minute area of the gear's surface.

• Shot-peening is another service which BRAD FOOTE has available for improving the quality of gears you buy for use in your own shop... or on the equipment you make for others. It is another step in our complete gear manufacturing process which means that *"no one shares our responsibility."*



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For Both Production and Small Lots

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"Gears Good Gears Only"

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NEVER TOO TOUGH

In forty-nine years of manufacturing gears we've learned that solving the knotty problems put to us by some of our customers is well worth the time and trouble involved. For, in addition to satisfied customers, it provides us with available answers to the same problems whenever they arise again.

Then, too, it gives our customers ever greater confidence in our ability to master their many gear requirements.

That's why your gear problems—whether great or small—will always be welcome here. THE EARLE GEAR & MACHINE COMPANY, 4707 Stenton Ave., Phila. 44, Pa.

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It's good business to do business with EARLE!

POWER FEED FOR FACING

A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

NEW Re-Designed Added Features

Boring, Facing, Turning

Grooving, Undercutting — All in ONE Toolhead

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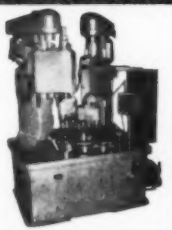
Chandler-Duplex

KAUFMAN TAPPING MACHINES

BUILT FOR SPECIFIC PRODUCTION JOBS

Every machine precision-built to meet the requirements of individual production jobs. Designed with fully automatic cycle, single or multiple spindle heads and other most advanced features.



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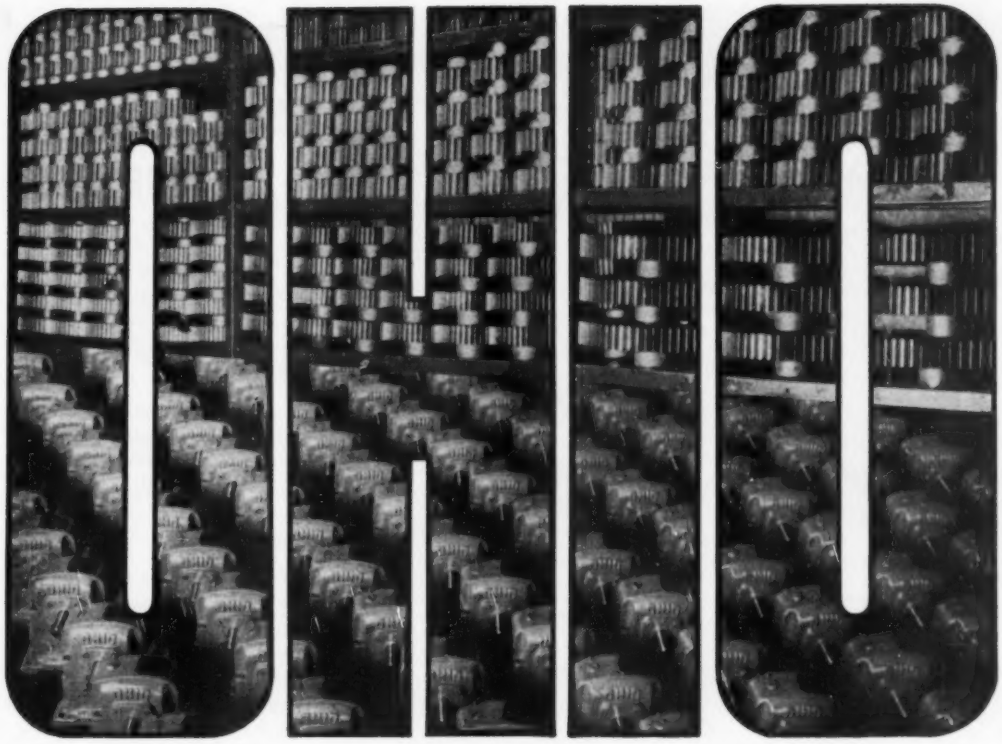

Ohio Gear is setting New Standards—New Standards in quality and accuracy—New Standards in uniform precision—New Standards in every detail of workmanship.

Whether it is a single gear, sprocket or speed reducer, an intricate drive, or precision engineering, you will find Ohio Gears and Reducers fit your specifications in every detail of material, machining, and finished dimensions. Call your nearest distributor or write direct.

ESTABLISHED 1915

THE OHIO GEAR COMPANY

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*Baltimore, Md.
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*Brooklyn 6, N. Y.
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Buffalo, N. Y.
F. E. Allen
*S. H. Pooley Belting Co.
*Chicago 7, Illinois
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*Cleveland 2, Ohio
J. A. Shomer Co.
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Ohio Gear Co.
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*Findlay, Ohio
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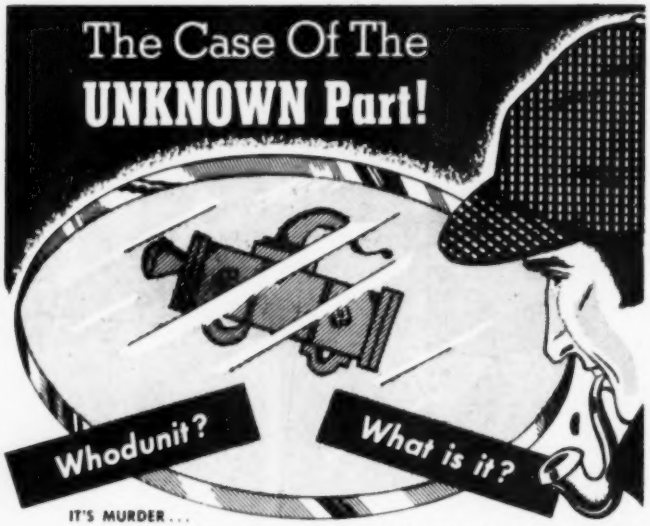
IN CANADA. *Montreal, Quebec, John Braidwood & Sons, Ltd.

*Stocks Carried.

The Case Of The UNKNOWN Part!



IT'S MURDER . . .

. . . for your customers to try to reorder metal parts which aren't properly marked.

And it blackjacks your production, too, when your components can't be identified *instantly*.

SOLVE THE MYSTERY—
Mark 'Em for Profit . . .

. . . with impressions that help you in a hundred ways! Your name, model number, part number, operating instructions, decorative designs and other information can be ROLLED legibly and *permanently* into all of your metal products. It's quick, easy and *profitable!*

FREE MARKING ADVICE

Simply send prints or samples of parts to be marked, together with exact lettering and its location, for free recommendations.

WRITE FOR FREE CATALOG . . .

. . . It will help you choose the marking equipment—from hand stamps to marking machines—that will suit your *exact* needs.

CASE CLOSED By

If It's Worth Making—It's Worth Marking. If It's Worth Marking—Mark It Well.

GEO. T. SCHMIDT, INC.
1810 Belle Plaine Avenue
Chicago 13, Illinois

How efficient is YOUR shop?

Over 42 per cent of metalworking production equipment is now over ten years of age . . . 19 per cent of it was bought more than 20 years ago!

This means that there is more over-age and obsolete production equipment operating in metalworking shops now than in 1945, and the rate of obsolescence is growing.

How about your shop? Are you equipped adequately with the modern, high-efficiency machinery and equipment which alone can produce the better products that cost *less to buy* which everybody wants? How does your shop compare with those of your competitors, and with metalworking shops generally?

You can find out quickly by writing for a copy of the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment. Here are all the facts on the age and number of 155 major types of production equipment, operating in 15 manufacturing divisions and 25 major production areas. Price: $2.00 per copy.

American Machinist
Reader Service Department
McGRAW-HILL BUILDING
NEW YORK 36

From the *American Machinist* Library of *Tips for Top Shop Men*

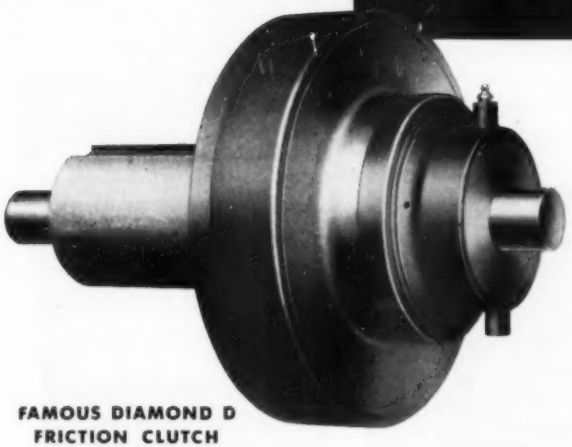
TAKE a man's pride in his job away, and there isn't much left; he becomes another automaton. Even a trained seal enjoys the applause as much as he does the fish.

WHEN you walk the tight-rope between close tolerances, or between good and bad finish, balance is vital. Be sure you have it, in machine-tool spindle or shaft, in tooling, in fixture. It will pay out in longer tool life and reduced scrap.

ROLLING GRIP
FRICTION CLUTCH
"NO TOGGLES!"
1/3 to 21 H.P. CAPACITIES

DODGE FRICTION CLUTCHES

Proved in thousands of industry's toughest jobs!



FAMOUS DIAMOND D
FRICTION CLUTCH
CAPACITIES UP TO
470 H.P.!

Look to Dodge for the clutches to meet your specific needs. Dodge leadership in the field of mechanical power transmission is strikingly evidenced in the advanced design and engineering of a complete line of friction clutches, in a full range of sizes with capacities from 1/3 hp to 470 hp.

ROLLING GRIP FRICTION CLUTCH

New and simplified design gives new ease of control with positive drive and extreme ruggedness. There are no toggles! Instead the mechanism shifts smoothly on hardened steel balls—and has the positive grip of a wedge. (Operating parts enclosed for safety yet quickly accessible for service). Available from distributors' stocks in two types—Bolted Plate or Gear Tooth Mechanism in sizes from 1/3 hp to 21 hp at 100 rpm.

DIAMOND D FRICTION CLUTCH

Built with the stamina for grueling service, this rugged clutch has a world-wide reputation for dependability. It's compact, too—completely enclosed in both engaged and disengaged positions. Adjustment is simple—an Allen wrench at one point does the job. Available in single, double or triple friction plate design in several types of construction. Capacities from 21 hp to 470 hp at 100 rpm.

DODGE MANUFACTURING CORPORATION
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DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

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TORQUE-ARM SPEED REDUCER

DODGE TIMKEN PILLOW BLOCKS

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

STANDARDIZE ON WESPO Fixture Clamps Component Parts

SAVE UP TO 70% DESIGNING AND MACHINING

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TEMPLATE DRAWINGS OF ALL CLAMPS & PARTS SENT ON REQUEST

There is a WESPO Clamp Assembly to suit every job—15 types—100 sizes. WESPO Clamps are carefully designed to meet the needs of Fixture Designers—Tool Makers—Machinists.

OVER 400 PARTS AVAILABLE

WESPO parts are precision manufactured of quality steel—heat treated and rust proofed. They are made for heavy duty and long usage and have proved their value in many industries.

Wespo No. 7 Clamp Assembly

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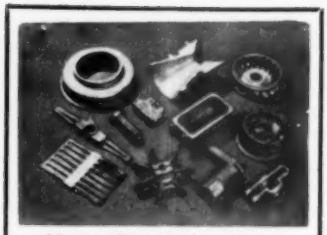
WEST POINT MFG. CO. 26933 West 7 Mile Road Detroit 19, Michigan



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in inch ounces . . . inch pounds . . . foot pounds (All Sizes from 0-6000 ft. lbs.)

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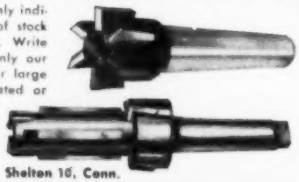
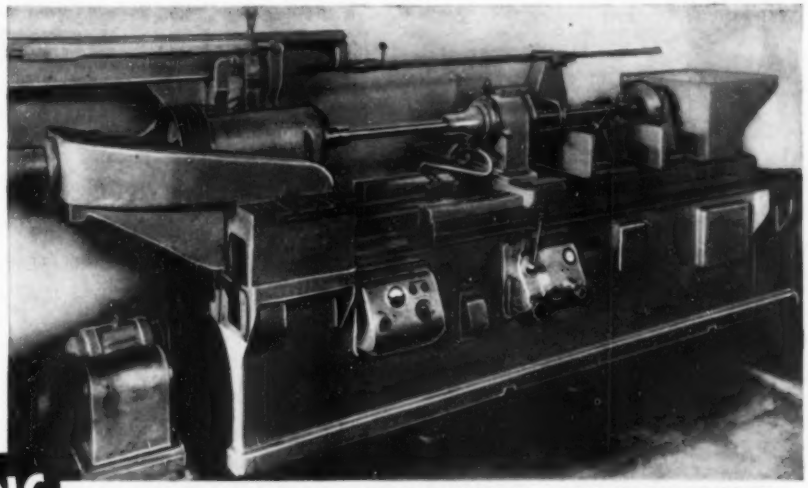
MILLING CUTTERS STOCKED IN OVER TWENTY TYPES

The mills shown here are only indications of the large line of stock and special Apex designs. Write for catalog showing not only our milling cutters but also our large single-point line with serrated or round shank tool bits, many of the latter interchangeable and usable in other standard holders.



APEX TOOL & CUTTER CO., Inc., Shelton 16, Conn.

Translates Advanced Jet Engine And Rocket Design Into Reality . . .



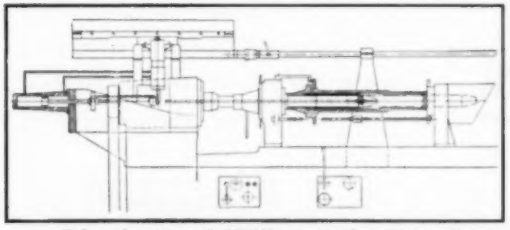
ALFING PRECISION BORING MACHINE

For Internal Profiling of Jet Engine Shafts in ANY Length and Profile!

Completely different in concept from conventional methods, the ALFING employs a newly developed, quick-hardening and reusable matrix material, poured in between a sizing bar and the rough drilled and turned component. This material acts as a continuous bearing for the boring bar, giving it rigid support. The tool rapidly cuts away the component and its own bearing as the shaft is bored.

The component is positioned in the ALFING, and the boring bar – exactly the size of the sizing bar – carries a tool that moves radially from the center line of the bar, and controlled through a hydraulic system by means of a template. The tool is withdrawn to a point within the O.D. of the boring bar, which is then inserted into the component. As the boring bar revolves, the table moves away from the headstock, carrying the component with it.

If you are concerned with the production of jet engine shafts, or any internal profiling, investigate the ALFING. Our engineers will gladly supply full details without obligation.



SEE ITS ADVANTAGES . . .

- *Up to 10 times faster than conventional methods.*
- *No deflection of boring bar.*
- *Guaranteed concentricity.*
- *Cutting tool at minimum distance from its bearing, allowing full advantage of carbide.*
- *Chips easily removed by high pressure coolant, permitting fine finish.*

• *Take advantage of ALFING's more than 10 years' experience in internal profiling!*

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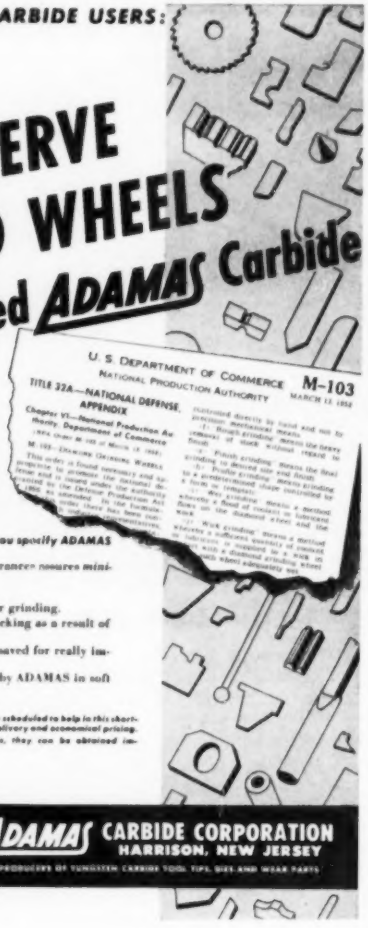
CANNY CARBIDE USERS:

CONSERVE DIAMOND WHEELS with preformed ADAMAS Carbide


U. S. DEPARTMENT OF COMMERCE
NATIONAL PRODUCTION AUTHORITY
M-103
TITLE 32A—NATIONAL DEFENSE,
APPENDIX

The National Production Authority order M-103 severely restricts the use of diamond wheels by: 1) limiting offhand rough grinding and finishing with resinoid bonded wheels, 2) curtailing inventories to 60 day periods, 3) requiring the use of coolant on all diamond wheel grinding, 4) allowing a maximum of ¼" depth of diamond and 100 concentration on all wheels.

This regulation will impose no real hardship if you specify ADAMAS preformed blanks because:

★ *Careful and accurate preforming to close tolerances assures minimum stock removal.*

Additional advantages are:

★ *Labor savings*... fewer man-hours required for grinding.

★ *Minimize breakage*... eliminates danger of cracking as a result of overheating.

★ *Conservation*... precious diamond wheels are saved for really important finishing jobs.

★ *Economy*... preforming is done inexpensively by ADAMAS in soft material saving you costly wheels.

Delivery of ADAMAS *preformed blanks is now scheduled to help in this shortage. An inquiry will quickly demonstrate speed of delivery and economical pricing. If ADAMAS standard blanks fit your requirements, they can be obtained immediately from stock.*

I'd like the new ADAMAS catalog and price list for ordering standard and special tool tips.

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Title

Company

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PRODUCERS OF TUNGSTEN CARBIDE TOOL TIPS, DIES AND WEAR PARTS

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Whatever the subject . . . if it is concerned with the production of better metalworking products at lower costs . . . you will probably find many sensible, helpful answers and suggestions in one or more of *American Machinist's* Special Editorial Reports. There is one in every issue of this magazine, and over 60 of our previous Special Reports are available now in reprint form.

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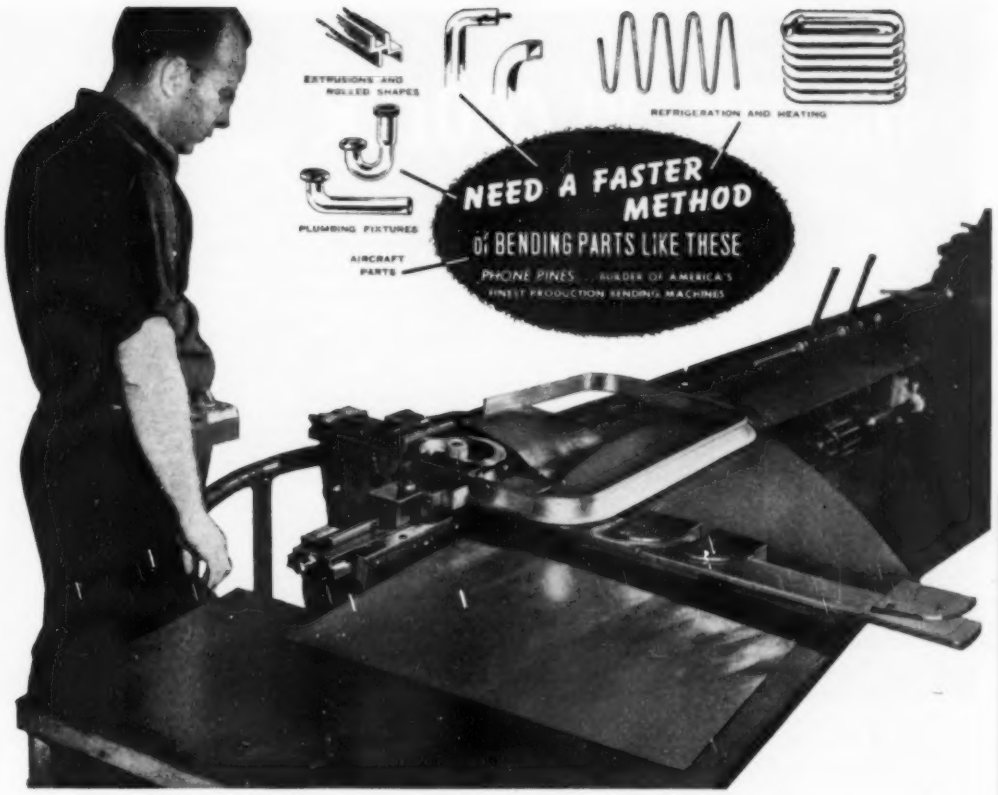
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AIRCRAFT PARTS
NEED A FASTER METHOD
of BENDING PARTS LIKE THESE
PHONE PINES . . . BUILDER OF AMERICA'S FINEST PRODUCTION BENDING MACHINES

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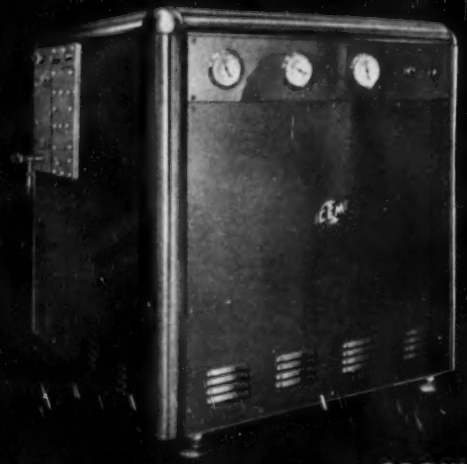

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Cools cutting oil at the rate of 200 gallons per hour for two drilling operations at the same time. Capacity on other operations in proportion, depending on working conditions.

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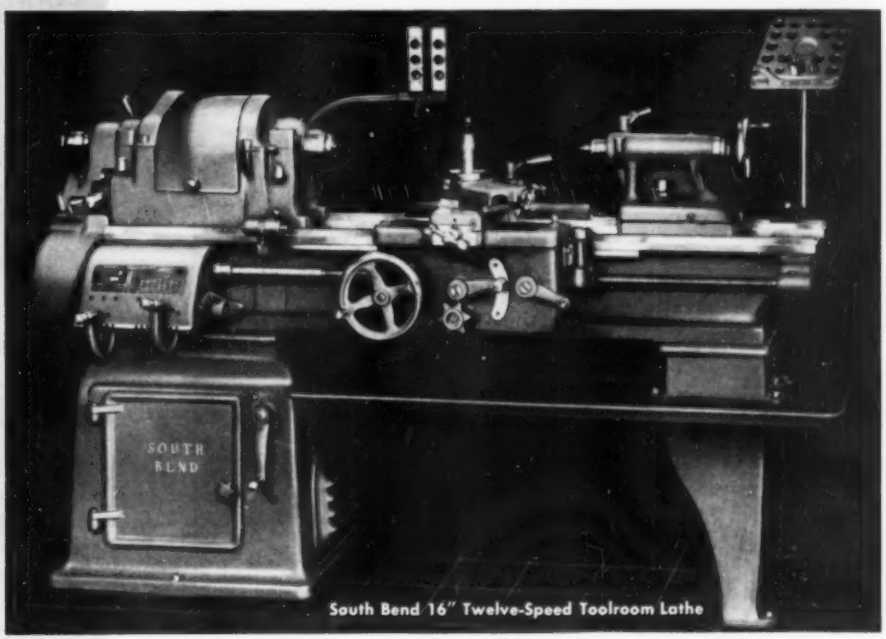

South Bend 16" Twelve-Speed Toolroom Lathe

SPECIFICATIONS

Spindle Speeds — 12. Direct drive: high range 300, 550, 945; low range 150, 278, 475. Back gear drive: high range 32, 70, 118; low range 20, 33, 60.

Spindle Bore — 1⅞".

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Swing over saddle cross slide — 9⅝".

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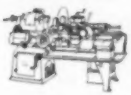
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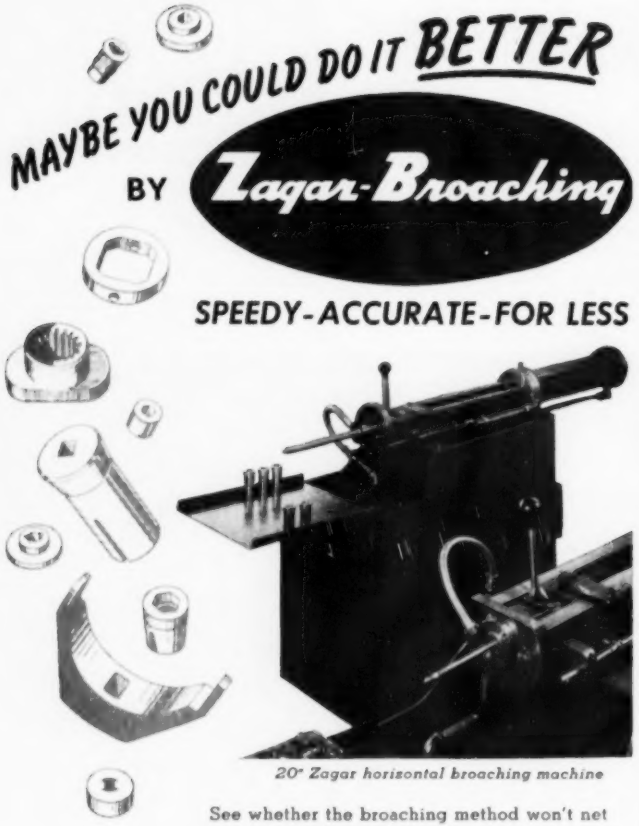

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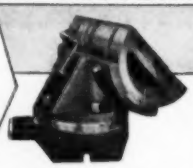

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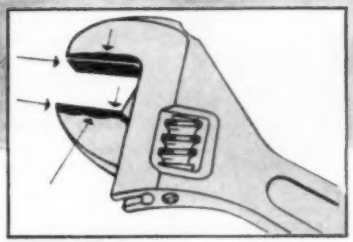

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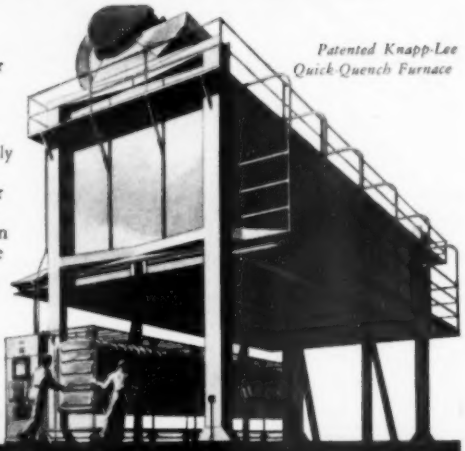

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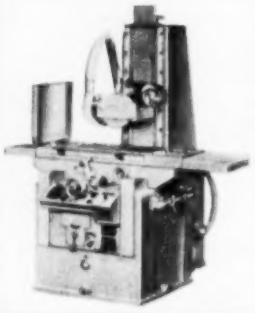

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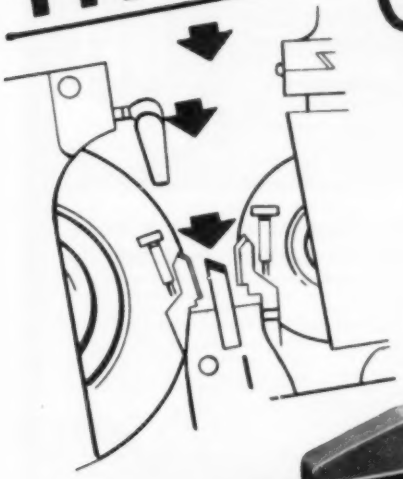

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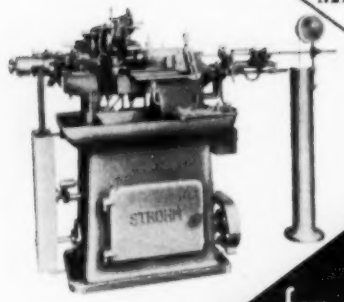

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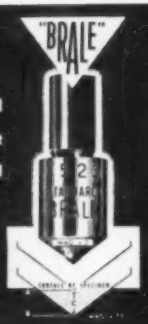

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. . . an entirely new approach to electrode and holder construction for spot welding pressures over 6000 pounds

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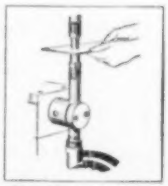

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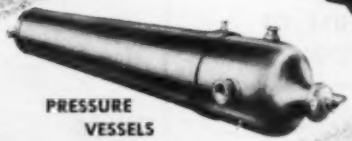

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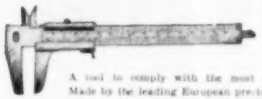

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A tool to comply with the most exacting demands. Made by the leading European precision tool craftsmen. Measures inside, outside, thread and depth.

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#30-61	Chrome Steel	.001" & 1/128"	$14.00
#30-64	Chrome Steel	.001" & 1/20 mm	$14.00
#30-62	Stainless Steel	.001" & 1/128"	$16.50
#30-65	Stainless Steel	.001" & 1/20 mm	$16.50
With set screw			
#30-78	Chrome Steel	.001" & 1/20 mm	$ 9.75
Total length of above models 6"		Scale 6"	

12" Calipers and Height Gauges also available.
Leather cases supplied free of charge with each caliper.

M-Z-B

MICROMETERS

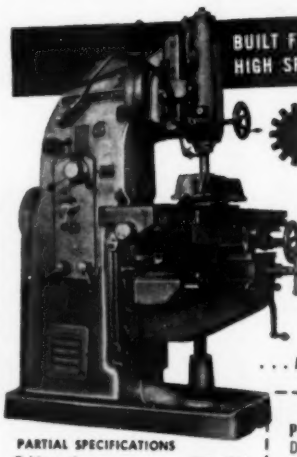
M-Z-B Micrometers 1" size to read .0001" with hardened threads, stop-nut and ratchet comparable to the best; only $15.00.

Made by the men who made precision tools famous with the "know-how" and experience that produced hundreds of thousands of the finest calipers and micrometers ever sold.

Send for our latest literature giving detailed information on these precison tools.

We also import fine precision pliers—send for information

INTER-CONTINENTAL TRADING CORP. 90 WEST STREET NEW YORK 6, N.Y.



BUILT FOR ENDURANCE AND HIGH SPEED PRODUCTION!

DIMCO

NEW

VERTICAL MILLING MACHINE

Model A.V. 3N

SHORT DELIVERY
. . . No Priority Required!

PARTIAL SPECIFICATIONS

Table surface	57" x 14"
Table power trav.; Long	39¼"
Cross	11"
Vertical	17¼"
Vert. trav. of spindle	6⅝"
Max. dist. spindle to table	19⅝"
12 spindle spds.; Range	16-650 rpm
9 table power feeds rates, p.m.	
Long. & cross	.3⅛-13¾"
Vertical	.5/16"-.9⅝"
Quick power trav.; all dir.	37"
Spindle taper, Amer. Stan.	50

POWERFUL and rugged, the DIMCO Vertical Miller is precision designed and constructed to give top, economical service. Other fine DIMCO machine tools include engine and turret lathes, grinders, shapers, radial drills, facing lathes, etc. Write us today for complete details!

KELVIN SYSTEMS CORPORATION K

IMPORTERS OF MACHINE TOOLS
RADIAL DRILLS • MILLERS
TURRET LATHES • GRINDERS
SHAPERS • COPYING LATHES

Let the chips fall where they may...

Chase® Free-Cutting Brass is readily cleared

For heavy feeds and high cutting speeds you can't beat Chase Free-Cutting Brass rod and bar. Chips from these Chase copper alloy products are short and brittle and are readily cleared from the cutting tools even during rapid and intricate cutting operations. That means longer production runs and longer life for your tools.

Write today for a copy of our book "Free-Cutting Brass—Bronze—Copper".

Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

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Baltimore	Dallas	Kansas City, Mo.	New Orleans	Rochester†	
Boston	Denver†	Los Angeles	New York	St. Louis	(†sales office only)
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FREE Chase 56-Page Book gives valuable data on free-cutting wrought copper alloys, their selection and use.

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Please send me free book "Chase Free-Cutting Brass—Bronze—Copper".

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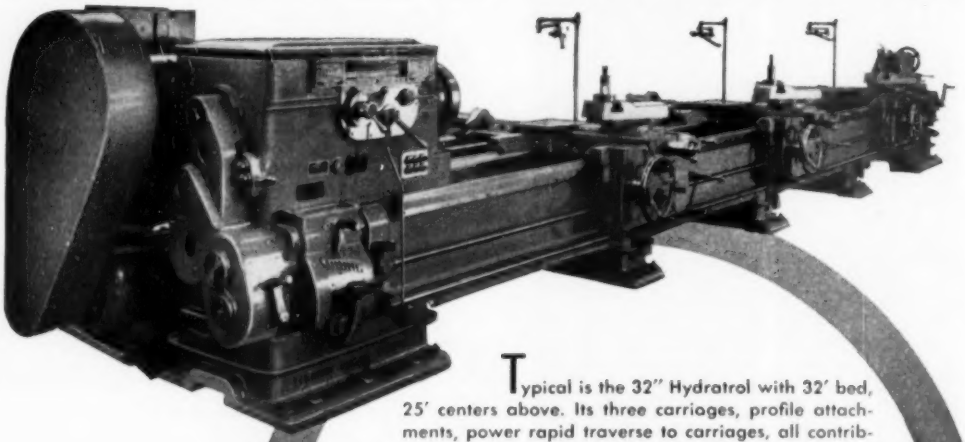
Again Helping Uncle Sam to Lower Costs and Increase Production!

LEHMANN'S VERSATILITY OF DESIGN

Machines Gun Tubes Better and Faster



Typical is the 32" Hydratrol with 32' bed, 25' centers above. Its three carriages, profile attachments, power rapid traverse to carriages, all contribute to doing the rough and finish turning of the O. D. on gun tubes better and faster.

CHECK THESE STANDARD FEATURES

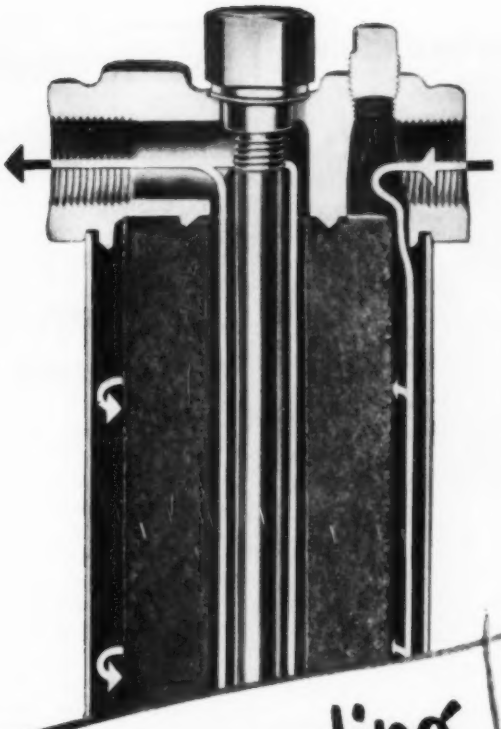
- **Hydraulically operated speed changes.**
- **Simplicity in construction, simplicity and safety in operation.**
- **Automatic Slide Rule indicates spindle speeds, operation numbers, cutting speed.**
- **Self-compensating hydraulic friction clutches and brakes.**
- **Speed changes through positive clutches, gears remaining in constant mesh.**
- **Spindle release for chucking.**
- **Perfect, safety control lubrication with filtered oil.**

Six Sizes

Medium Duty 16"-18"
Heavy Duty 20"-25"
Heavy Duty 32"-36"
Heavy Duty 40"-50"

Lehmann
MACHINE COMPANY

CHOUTEAU AT GRAND • ST. LOUIS 3, MO.



No Channeling with this micronic filter

Won't shrink, won't swell. Won't harden, won't soften. Won't distort in any way. That's Cuno MICRO-KLEAN . . . the filter that outlasts any other replaceable-cartridge filter 2 to 1!

CUNO

Fluid Conditioning

Removes More Sizes of Solids from More Kinds of Fluids

Strain fuels, lubricants, process fluids, etc.—AUTO-KLEAN
Filter fuels, lubricants, process fluids, etc.—MICRO-KLEAN
Clean raw water, recirculating water, etc.—FLO-KLEAN

Build This into Your Designs: Low-Cost Fluid Filtration

For a wide range of micronic filtration problems, the Cuno MICRO-KLEAN is the *lowest-cost* device you can specify, for the *efficiency* you desire.

It's *low-cost* because it's so simple. Just a single cartridge of "felted" fibres. Easy to install, easy to replace. And it *lasts* twice as long as other cartridges, because it has twice the dirt capacity, due to maximum porosity (85-90%) and exclusive "graded density in depth".

It's *efficient* because it works by a positive mechanical principle—the only micronic filter to do so. Thousands of tiny fibres are carefully distributed throughout the structure to form interstices in which the solids are trapped.

The cartridge gets its strength from resinous impregnation and polymerization.

Saves Space, Too!

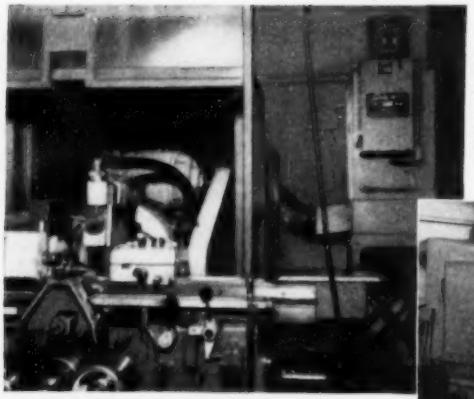
Cuno MICRO-KLEAN is *all* filter—no structural components. This means less space needed—makes full flow filtration practical for either external or built-in applications.

GUARANTEED to remove 100% of all solids for which it is rated* plus a large percentage down to 1 micron. Capacities: a few to over 800 gpm. Single or multiple-cartridge units.

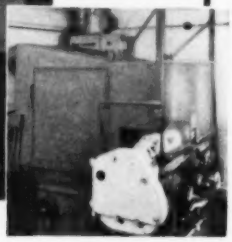
*15, 25, 50 microns.

Cuno Engineering Corporation
Dept. 242D, South Vine Street, Meriden, Conn.
Please send information on Cuno MICRO-KLEAN for following installations.....
Name.....Title.....
Company.....
Address.....
City.....Zone....State....
Please attach to business letterhead

today's best buy is better air!



Electro-Mist provides complete oil mist control for thread grinder at Lear, Inc., Grand Rapids



SAFETY INSURANCE

for high speed cutting and grinding!

Electro-Mist unit collector eliminates oil mist and smoke at the source.

The hazards created by coolants and the nuisance of oil mist and smoke from high speed grinding and cutting operations are completely controlled by AAF's Electro-Mist collector. A self-contained unit designed specifically for this purpose, the Electro-Mist exhausts material at the source by combining heavy duty industrial filters with electronic precipitation. Its unique design allows easy removal of collector plate assemblies, as well as access to all parts . . . without tools . . . thus reducing maintenance to a minimum.

The Electro-Mist also salvages as much as 2 to 5 gallons of coolant daily in its oil reservoir, which may be piped back into the machine or drained off, as desired. The above illustrations show how the plastic front of the hood may be raised for observation or adjustment, or when lowered, provides complete enclosure for the grinding or cutting operation.

If you are interested in safer, cleaner *high speed* grinding and cutting operations call your AAF representative today or write for complete details on Electro-Mist contained in AAF Engineering Bulletin No. 251.

American Air Filter
COMPANY, INC.

207 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

FIVE WAYS TO FORM GEARS

1. Powder Metallurgy
2. Casting
3. Extrusion
4. Cold Drawing
5. Plastic Molding

These five processes are some of the methods used to produce precision gears. Each of these methods solves one or more production problems: cost . . . unmachinable material . . . complex shape.

"Five Ways to Form Gears," a 16-page *American Machinist* Special Report, explains each method . . . including latest examples, applications, relative costs, tolerances, and hints on machining.

Equally useful Special Reports on the following related subjects are also available:

A MANUAL OF GEAR-MAKING EQUIPMENT
12 pages — 20 cents a copy

MODERN GEAR-CUTTING EQUIPMENT
12 pages — 20 cents a copy

HOW TO HEAT-TREAT SPUR GEARS
12 pages — 20 cents a copy

READER SERVICE DEPARTMENT

American Machinist
McGraw-Hill Building
New York 36, N. Y.

From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

WERNER
MILLERS

From PIGMY Size 0
to GIANT 5

VERTICAL:
Size 0 to 5
Table sizes 22" x 17" up to
90" x 20"

PLAIN:
Size 0 to 4
Table sizes 22" x 7" up to
76" x 15½"

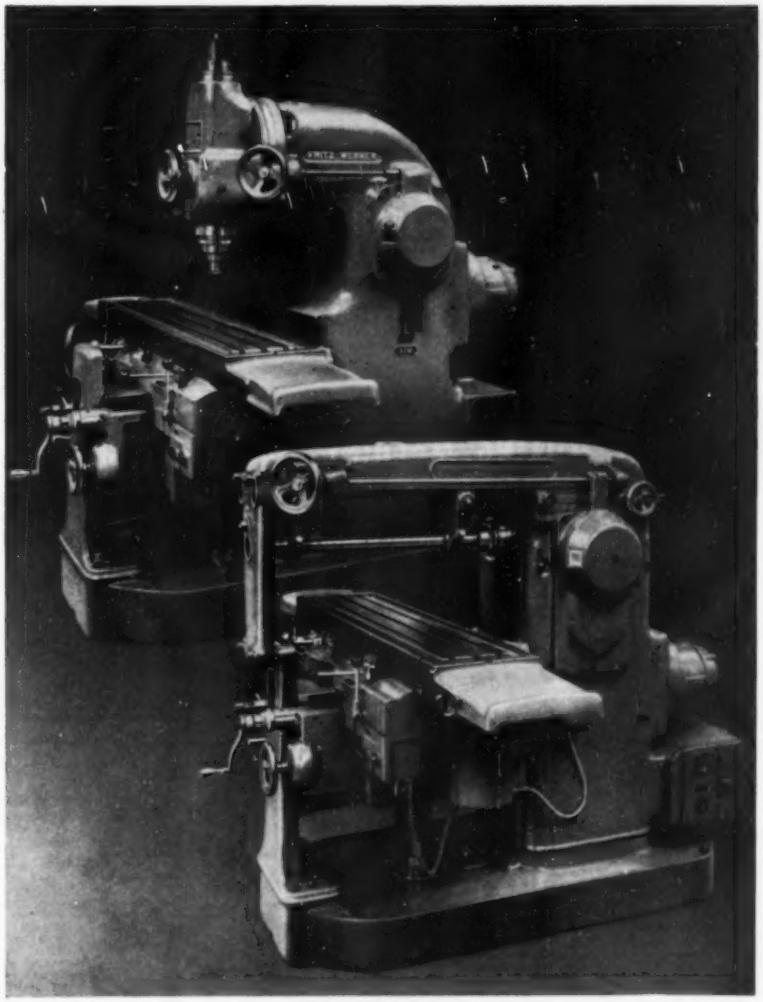
UNIVERSAL:
Size 1 to 3
Table sizes 29" x 8" up to
63" x 14"

— *also* —

MANUFACTURING MILLERS:
Sizes 1, 2, 3
2-19 3-25

Shown Above:
No. 0 Vertical

Shown at Right:
No. 3 Vertical
No. 3 Plain



PROMPT and REASONABLE DELIVERIES

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For further information about these and other machines contact Dept. AM.

MARAC MACHINERY CORP. 1819 B'WAY • N.Y. 23

When job specifications leave no leeway, when extreme tolerances must be rigidly maintained . . . that's when the built-in precision of Grand Rapids Grinders proves most valuable.
Defense commitments are delaying rapid fulfillment of your orders . . . but as always we're doing our best to serve you.

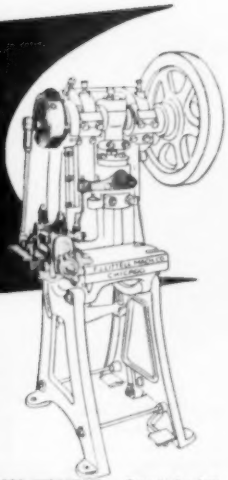
GALLMEYER & LIVINGSTON CO.
330 Straight Ave. • Grand Rapids, Mich.

GALLMEYER & LIVINGSTON

GRAND RAPIDS GRINDERS
. . . the very best

Manufacturers of Surface Grinders • Cutter and Tool Grinders • Tap and Drill Grinders

FOR LOW COST AND BIG RESULTS
Feed Your Presses With
LITTELL
STYLE "M" AUTOMATIC
ROLL FEED



FOR SPEED . . . With Style "M" automatic feeding your press can easily produce 9,000 stampings an hour at 200 strokes per minute, or 4,600 stampings an hour at 100 strokes per minute.

FOR VERSATILITY . . . Style "M" feeds left to right, right to left and front to back. Feed direction can be reversed by simply reversing clutch. Feed lengths per stroke are 0 to 4⅜" with standard gears and 0 to 8½" with compound gears.

FOR ADAPTABILITY . . . Style "M" is adaptable to any standard punch press. It feeds coil stock up to 8" wide and up to .055" thick (17 gauge).

FOR SAFETY . . . Style "M" automatic feeding keeps hands and fingers away from danger, prevents costly accidents.

FOR DURABILITY . . . Style "M" is built with hardened and ground feeding rolls and the other quality features that have made Littell Roll Feeds accurate and durable since 1918.

FOR ECONOMY . . . Style "M" brings you a big saving in price. It gives your presses the lowest insurance rate. It cuts your cost per stamping by multiplying press output.

WRITE FOR CATALOG

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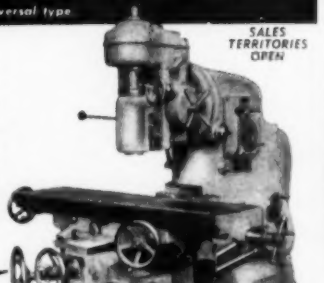
District Offices: DETROIT, CLEVELAND

NEW HURÉ *PRECISION*
VERTICAL MILLING MACHINE
Also available in Universal type

Built in France to accurate American specifications and measurements, this sturdy machine incorporates all the latest developments in machine tool design . . . with special features that years of experience have proved highly desirable in milling machines of this type.

SALES TERRITORIES OPEN



NO PRIORITIES STOCK DELIVERY

PARTIAL SPECIFICATIONS		MODEL 273	MODEL 274
	Long. feed range	32"	37-25/64"
	Cross feed range	14⅞"	16-9/64"
	20 speeds range RPM	20 to 1600	20 to 1600
	Motor	6	7

• Write today for illustrated folder giving full details.

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for machine tools!
MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
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choose FERRACUTE INCLINABLES
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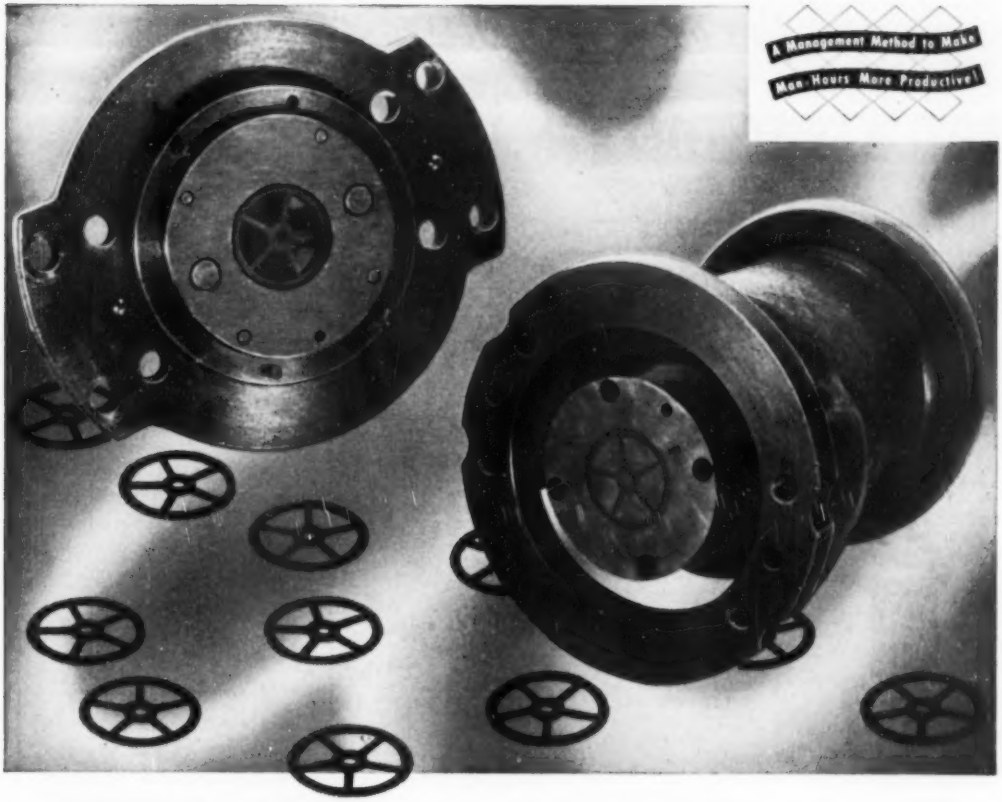
Complete line of mechanical presses. Since 1863
FERRACUTE MACHINE CO., Bridgeton, N. J.

LUERS
Patented Cutting Off Tool Holders
Patented Cutting Off Blade
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips MEANS MAXIMUM CUTTING EFFICIENCY
Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

RANDALL and STICKNEY
Dial Gauges and Indicators

Model C 50 B

are accurate, reliable and built to stand hard usage.
Model "C 50 B" has a 2½" overall diameter, balanced dial 0-25-0 with .0005" graduations, ⅛" range and movable dial easily set at zero.
The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.
This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.
FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gauges Since 1896



Why Not Gear Up For Today's Production *This* Way?

For 11 years this Stentor blanking die and punch gave trouble-free performance, averaging 100,000 gears per grind. This record enabled management and production to avoid production delays by keeping machines operating with fewer shut-downs for resharpening. The precision gears, 120 teeth/90 pitch, are made from 24 ga., ¼-hard brass. In heat treatment the die moved only .0005" on the maximum diameter of the gear.

It wasn't a happy coincidence that the tool and die steel was perfectly suited to put production from the tools on a smooth, trouble-free basis. It was planned that way—with the help of the Carpenter Matched Set Method. For the Method not only enabled this plant to eliminate costly experimentation in selecting the right steel, but enabled management to forecast output in advance because they could count on the tools to produce the parts *on time*.

Used in hundreds of plants, the Method offers far more than simplified tool steel selection. It makes machine operators more productive. It enables your plant to carry lower tool steel inventories. It makes heat treating easier, simplifies toolroom and production procedures. What's more, it is amazingly easy to apply. No extra cost or bother. To discover what it can do for you, ask for the new booklet "How to Get Better Tool and Die Performance". THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Company
Port Washington, N. Y.—"CARSTEELCO"

Carpenter

MATCHED TOOL & DIE STEELS

More than top-grade steels . . . a Method to keep tooling and production on schedule!

For your convenience, Carpenter carries warehouse stocks in principal cities throughout the country.

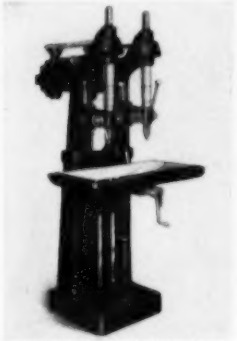
"Buffalo" Tips on Better DRILLING

RIGID CONSTRUCTION
MEANS • Greater Accuracy
• Lower Drill Breakage

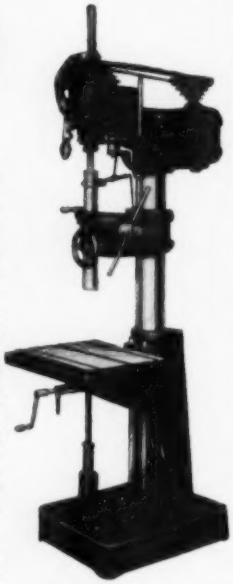
The less vibration transmitted through the spindle, the greater the accuracy in drilling, reaming and tapping. In the "Buffalo" No. 14 Drill, a machine designed to do extremely accurate work in the smaller range of drill sizes, the column, base and table are heavy and rigid. The spindle is alloy steel, running in ball bearings of a specially selected grade. The two ball bearings in the feed sleeve are mounted opposed and under constant spring load, preventing end play. The spindle pulley is mounted on a broached sleeve held in accurate alignment by two full-sealed ball bearings in such a way that belt pull is not transmitted to the spindle. This and other precision construction features make "Buffalo" Drills lastingly accurate.

•

WRITE FOR INFORMATION ON THE DRILL FOR ACCURATE RESULTS ON YOUR JOB.



"Buffalo" No. 22 Drill for heavy work up to 2" capacity in cast iron. Note rigid construction. Write for Bulletin 2959-F.



"Buffalo" No. 14 High Speed Drilling Machine for manufacturing precision parts. ½" capacity. Write for Bulletin 2726-D.

"Buffalo" MACHINE TOOLS

DIAMOND JUBILEE 75th ANNIVERSARY

BUFFALO FORGE COMPANY
509 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING CUTTING BENDING

From the *American Machinist* Library of *Tips for Top Shop Men*

YOUR manufacturing engineers should have just one job: to make your present methods obsolete. The more they succeed, the greater is your productivity.

AN invisible boss presides over every collective bargaining session. He is not labor, management, or government—but is the customer, who exercises power of selection over your company's products.

TWO of management's most important words are "know" and "no." If you're strong on the first, you seldom hear the second.

HOW to cut your
TAPPING COSTS

• Tapping trouble in many cases can be traced to the improper choice of the tap for the job. Proper tap selection begins with analysis of the thread to be cut . . . material, size, tolerances, character, ultimate use, and number.

BETTER TAPPING

16 pages—25 cents each

This *American Machinist* Special Report will help you cut your tapping costs per threaded hole. This valuable article provides all the latest data on proper tap selection and application . . . from leading tap manufacturers and their largest users.

• Similar Special Reports on the following topics are also available.

THREAD CHASING

16 pages—25 cents each

•

HOW TO MILL, ROLL, AND GRIND THREADS

24 pages—35 cents each

READER SERVICE DEPARTMENT

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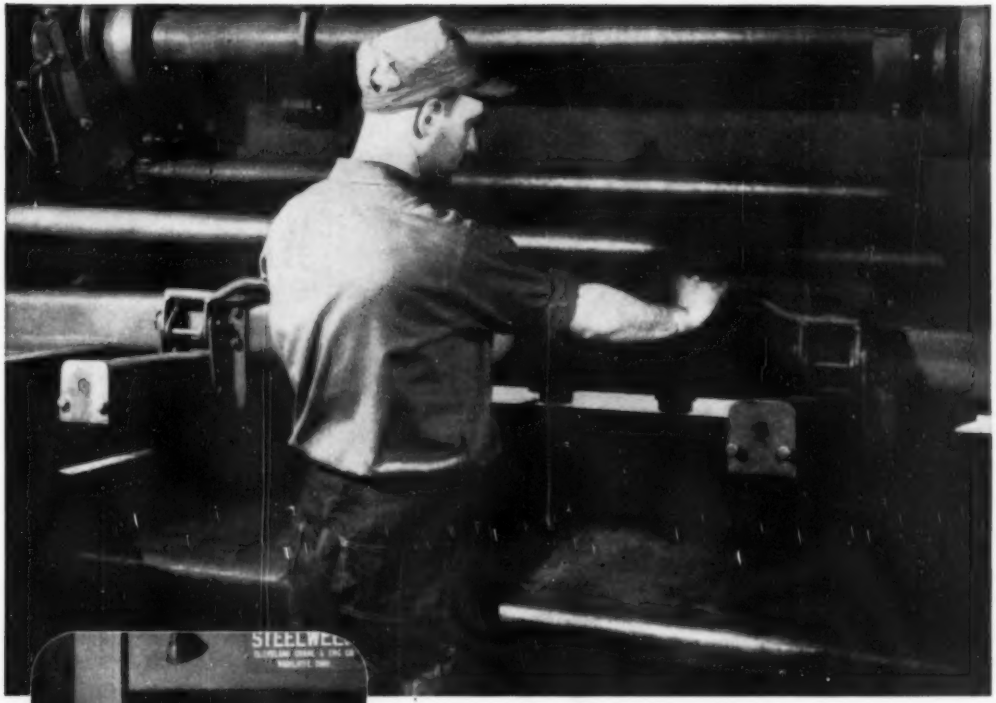
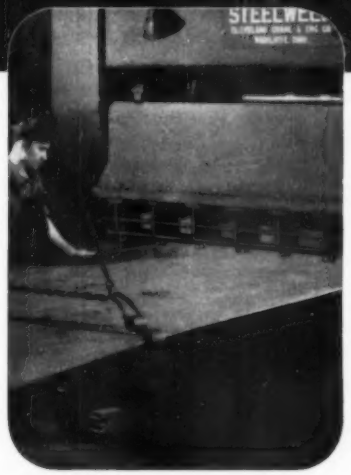
McGraw-Hill Building
New York 36, N. Y.





Steelweld Shears are packed with marvelous features that are not available in any other shears. Built in all sizes for thicknesses from 12 gauge to 1¼ inch.

LIFT-UP TYPE BACK GAUGE DELIGHTS OPERATORS AND SPEEDS SHEARING

Shear operators acclaim this back gauge which can be raised up and out of the way to allow long sheets to pass through. They like its smooth easy operation when setting it for use.

The back gauge is typical of many features that make Steelweld Pivoted-Blade Shears so outstanding. It is put in or taken out of service simply by the movement of a horizontal bar. No bolts to turn. No parts to assemble.

It is convenient to adjust, too. The operating crank and dials are at the outside front corner of the shear where readily accessible, eliminating need of going around to back of machine. It is mounted on ball bearings and equipped with an indicator which reads in inches and 1/100ths.

The back gauge is standard equipment supplied with all Steelweld Shears. Lift-up feature is furnished only for ⅜" capacity machines and larger. Metal cut on lighter machines is usually pliant enough to pass under a gauge without lift-up arrangement.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
1415 EAST 282nd STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

NEW PROCUNIER TAPPERS

Work FASTER
Last LONGER
...and save Taps too!

With the NEW "TRU-GRIP" Tap Holder

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

Procunier Tapping Equipment is the answer to today's pressing need for tapping equipment that will meet current high-speed production demands and at the same time reduce maintenance and operating costs.

Developed by practical craftsmen—who have concentrated exclusively on developing, improving and perfecting tappers for more than 30 years—Procunier tappers offer the rare combination of high speed, dependable accuracy, lasting endurance and economy of operation. Special exclusive construction features enable them to cut threads *faster, for longer periods*—with fewer spoiled pieces, fewer rejects. Here's why:

1. *Tap breakage is practically eliminated* due to the high sensitivity of the new Procunier cork-faced friction clutch which automatically regulates driving pressure. Thus, even "green" operators can quickly detect dull or loaded taps by the "feel" or pressure on the clutch.
2. *Strain and wear are minimized* and torsion eliminated thru special gear reversing mechanism which distributes pull thru three intermediate gears.
3. Chuck spindle is supported at both ends assuring true operation—*avoiding tap wobble.*
4. *Aluminum housings* assure greater strength and rigidity with minimum weight—a vital factor for high speed tapping.
5. PLUS many other exclusive features.

WRITE TODAY for more complete details and specifications on the complete line of Procunier Tapping Heads and see why Procunier offers the "finest in tapping equipment."

Procunier
SAFETY CHUCK CO.
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PROCUNIER SAFETY CHUCK CO.
14-18 S. Clinton St.
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Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

Name .....
Address .....
City ..... Zone ..... State .....

Hinged Hammer Moulds
1, 2½ and 5 lb. sizes—order your alloy lead hammer requirements from your machine tool supply house
or direct from

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a great new editorial service from your most useful magazine . . .

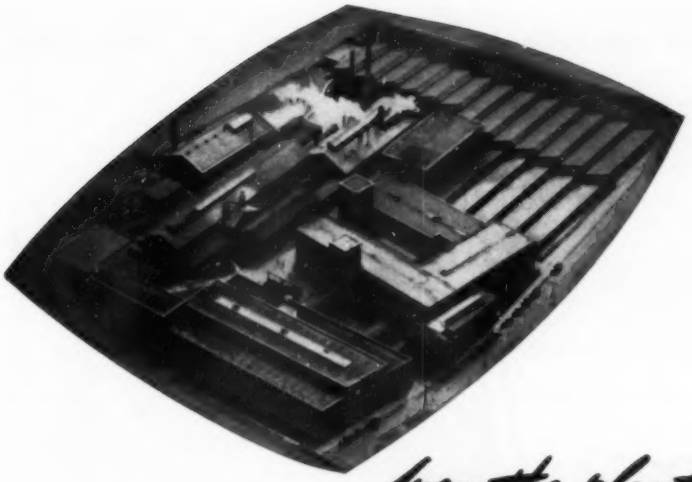
What's Ahead The Next 10 Years In Metalworking

Next October's 75th Anniversary Issue of *American Machinist* will bring you more facts and new ideas on the newest metalworking production methods, equipment, and materials than you have ever had at your fingertips before.

And all of them will be of even greater value to you because this issue will also provide . . . as a broad base upon which to plan your company's production needs . . . a thorough analysis of the economic factors important to Metalworking's future growth and markets. Abundant charts, tables, and research data will give you these essential background facts in quick-reading, ready-reference form.

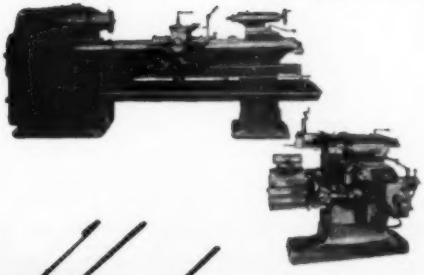
This far-sighted and fact-filled issue will raise to still higher levels our editorial value to you at the time we begin our second 75 years of service to metalworking production executives.

American Machinist
1877 1952



...from the plant of precision

No machine tool builder has ever surpassed Hendey's reputation for making *precision* machine tools. This reputation is based on an uncompromising standard established by the founder in 1870. This standard is exactly the same today. Only the method of achieving it has been changed—and constantly will be changed as new and better materials and techniques are developed. By concentrating all its efforts on just engine lathes and shapers, Hendey is able to provide the best thinking and the finest results in these fields. Hendey products are modern in design, are produced on modern equipment, and are as precise as modern inspection equipment will allow.



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MAIN OFFICE & PLANT: TORRINGTON, CONN.
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MODERN Hendey precision engine lathes and shapers

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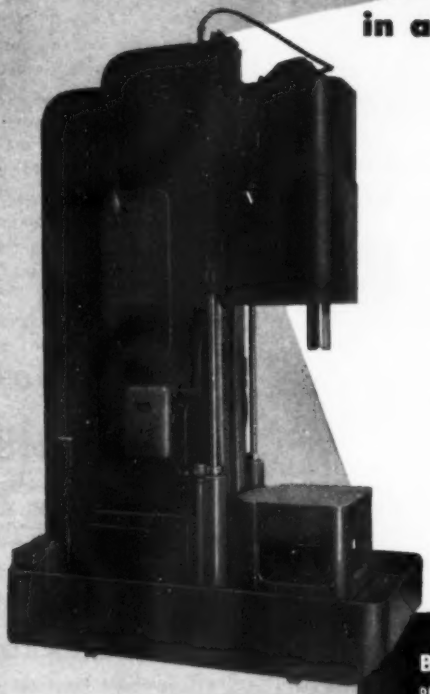
The Versatile BAKER 36HO DRILL...

provides increased productivity in a multitude of applications!



The standard Baker 36HO Heavy Duty Vertical Hydraulic Drill may be adapted to a multitude of multiple or single spindle drilling, boring, counterboring, spot facing or reaming operations. Provision for pick-off speed changeovers gives extreme flexibility of spindle speeds. The machine is of hydraulic saddle type feed and may be furnished with either standard plain table or indexing table with up to six indexing stations. Ample capacity is provided to drive one 5 inch diameter High Speed twist drill, drilling from solid in SAE-1035 steel. Write Baker concerning your specific job problem.

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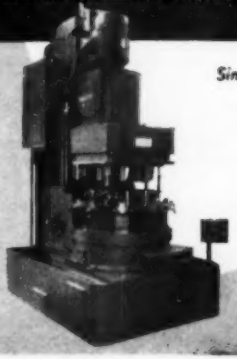
Illustrations show Baker 36HO as adapted for drilling wrench bodies for a leading manufacturer of crescent wrenches. Estimated production rate is 103 parts per hour at 100 % efficiency. Machine is easily converted for operations on varying sizes of wrenches.



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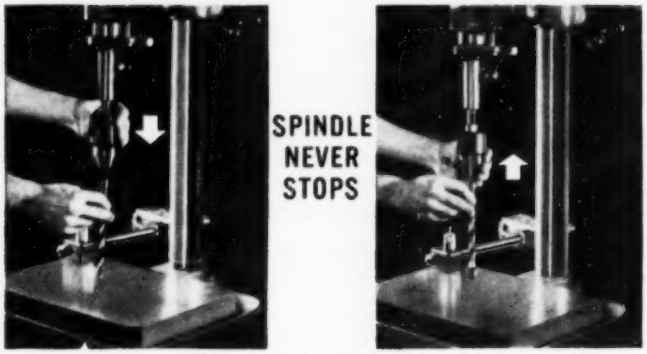
no keys . . . collets . . . or wrenches



HERE'S ALL THERE IS TO CHANGING TOOLS

TO OPEN Grip Sleeve – pull down – jaws open automatically – tool is released.

TO CLOSE – Insert new tool – push up tapered part – tool is locked in place.

SAVE TIME—Change tools with spindle running . . . no keys, collets or wrenches needed. Ideal for fast, uninterrupted production.

SAVE MONEY—One spindle does the work of several. Smooth, hardened, ground jaws grip tight without chewing tools. Grip increases with load.

IDEAL FOR—Precision drilling or for spotting, drilling and reaming in boring or milling machines; in lathe work for burring, turning and filing.

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FOR CONVENIENCE IN ORDERING

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REPRINTS...

Our *American Machinist* editorial reprint order form lists more than fifty currently available Special *American Machinist* Reports to Metalworking published since the war. If you would like a list of these Special Reports written specifically for metalworking production executives, send us a postcard and ask for "Editorial Reprint Order Form."

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NEW FACTS to help cut your die-casting costs

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"Controlling Die-Casting Flash," an 8-page *American Machinist* Special Report, is filled with the latest facts on how you *can* make flash much less a problem in *your* die-casting operations by concentrating on better die design.

Copies of this time-and-cost-saving Special Report are available at 15 cents each.

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Exceptionally fine opportunity for good man. Replies giving age, experience and salary desired will be held in strictest confidence.

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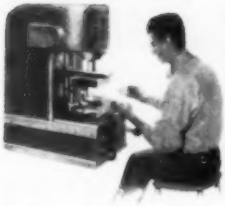
Assembly speed is doubled using Multipress to crimp a small brass contact to pen-type flashlight cases

20,000 mop clamps a day is cost-cutting speed of 35-ton Multipress using roll-feed and 4-stage dies



Dies stay sharp twice as long when Multipress is used in trimming flash and gate from die castings

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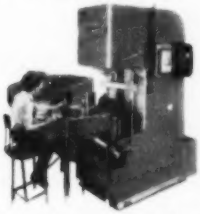
Six hours saved on every 100 finished units as famous elec-tric cleaner plant adopts Mul-tipress to clean cast housings

Output is boosted by 100% by famous toy train maker, staking 6-part assembly to-gether with Multipress



At twice the speed of pre-vious method, Multipress as-sembles bolts on electrical insulator holders

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In only four stages, Multi. press deep-draws a precision ordnance part formerly re-quiring 8 draws

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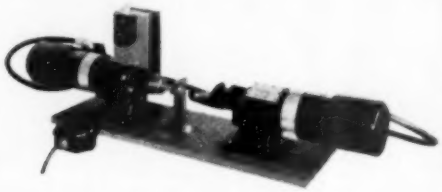
STANDARD OPPOSED DRILLING MACHINE



This Standard Govro-Nelson Drilling Machine is supplied completely wired so that the two Automatic Drilling Units work simultaneously from a momentary contact palm or foot switch with a dowel hole for fixture location. (Fixture not included.)

With the Units adjustable endwise up to 18" between chucks, it can be used as a centering machine. By mounting a simple hand-index fixture, it can be used for drilling wire holes in cap screws. Two opposed holes can be drilled at once. A riser plate permits the drilling of offset holes.

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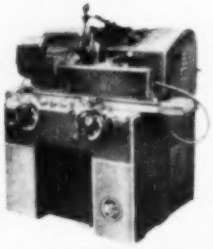

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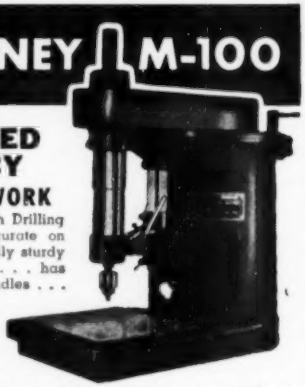
SIGOURNEY M-100



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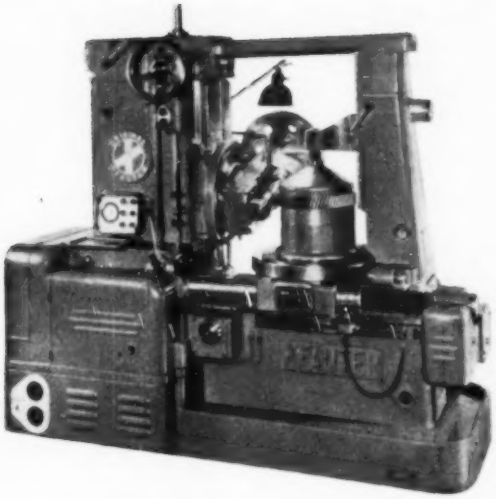

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Diameter:	10"	30"	40"	47"	71"
D.P.	10	3	2½	1¾	2½

ALSO:

Horizontal Spline Shafts Hobber; Worm and Thread Miller.

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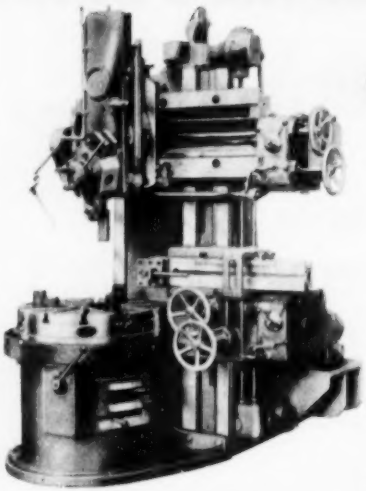

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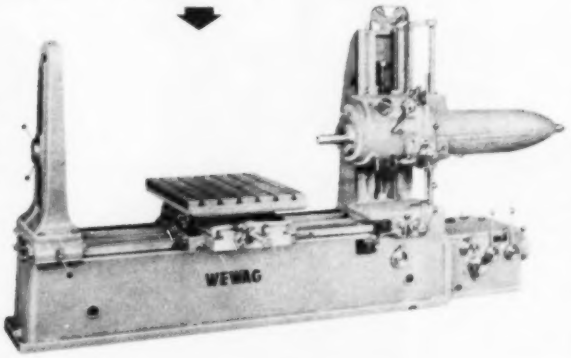
2¾" WEWAG Precision Universal Horizontal Boring & Milling Machine

With direct V-Belt motor drive, hardened and ground gears, power rapid traverse, table swivels 360°.



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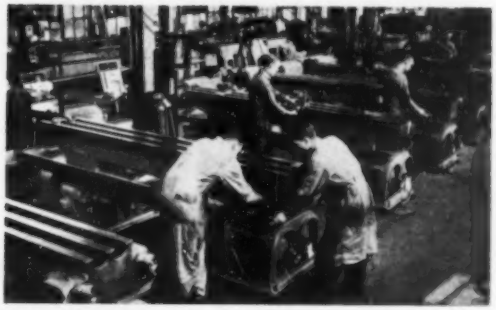
"Life Extension Institute" for Your Machine Tools

Speed was the problem here. As part of the Government machine tool re-activation program, Simmons has rebuilt over 400 machines. Shown in this bay (fore) are automatic screw machines, deep-hole drillers and various special tools. Despite this program, Simmons was able to continue its rebuilding for industry—thanks to its 120,000 square feet of plant capacity and diversified equipment.

Alignment of head and tail stock is part of the final test of this Landis grinder.

Sand blast facilities are maintained at Simmons to clean cast parts, remove inclusions.



Modernizing: To adapt these deep-hole drillers for carbide tooling, speed was doubled from 1500 to 3000 rpm; cooling system pressure was increased; heavier electrical equipment installed.

Rebuilding is the fastest way to get machine tools *today*. You will find that there are no long waits for delivery. *Engineered Rebuilding* guarantees user satisfaction. If you'd like to learn more about it, write for our quarterly, THE SIMMONS WAY.

SIMMONS MACHINE TOOL CORPORATION
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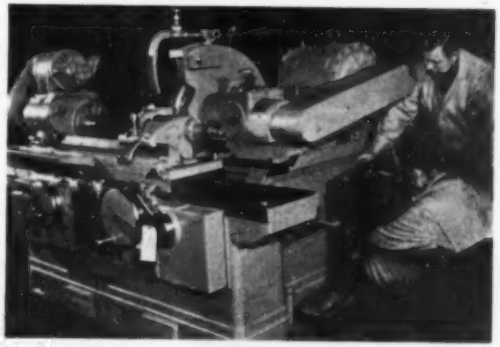
SIMMONS GIVES USED MACHINE TOOLS A NEW LEASE ON LIFE



Checking electrical systems is an important part of Simmons *Engineered Rebuilding*. Here, two technicians check a control panel on a rebuilt Cincinnati grinder prior to inspection.

14 Benchmasters kick out 202,500 parts per day!

...paid for themselves in 30 days!

The Nutt-Shel Company, Glendale, California, manufactures an assortment of aluminum, steel and stainless steel self-locking anchor nuts and nut and bolt retainers for the aircraft industry.

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Leading HEAVY EQUIPMENT manufacturer in Midwest desires qualified project engineer with *5 or more years experience* in the design of heavy duty off the road drive axles. Applicant should have some experience in and knowledge of axle manufacturing procedures, should be 30 to 45 years of age and have a mechanical engineering degree or equivalent.

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Steel fabricating manufacturer, employing 1,000 people and located in a northwestern Pennsylvania town of 25,000, requires an experienced Tool Engineer. Duties will include designing tools, jigs and fixtures for automatic and semi-automatic machines, dies for blanking, forming and shaping operations, and special tools for resistance and flash welding operations.

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STRAIGHT SIDE DOUBLE CRANK PRESSES — 1—Toledo #96½B Straight Side Double Crank Double Back Geared Punch Press. 450 Ton. 1—Hamilton #1089 Straight Side Double Crank Double Back Geared Punch Press. 255 Ton. 1—Bliss #9E Straight Side Double Back Crank Double Back Geared Punch Press. 225 Ton. 1—Toledo #95½B Straight Side Double Crank Double Back Geared Punch Press. 255 Ton. 2—Minster #50-7½-84 Straight Side Double Crank Back Geared Punch Presses. 315 Ton. 1—Cleveland 76-D-60. 180 Ton. 1—Bliss 7B 180 Ton. 1—Bliss 6E 106 Ton. 1—Toledo 92½C 88 Ton. 1—Toledo 93C 88 Ton. 1—Hamilton #426 88 Ton. 1—Toledo 95C 180 Ton. 1—Toledo 94A 150 Ton. 2—Toledo 93½ 126 Ton. 1—Cleveland 600-42 126 Ton. 1—Hamilton 545½ 88 Ton. 1—Cleveland 55D-42 88 Ton. 1—Bliss #5 88 Ton. 1—Waterbury Farrel 31 Ton. 2—Bliss #24A, Gap Frame Punch Presses 56 Ton.

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POWER SQUARING SHEARS—1—Niagara 10'—10G #3120. 1—Toledo #400—¾".

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SAWS—1—Do-All Model M.I. Metal Countour Band Saw. 1—Tannewits 36" Band Saw. Type GIE. 1—Johnson Metal Cutting Band Saw. Model J. 1—Power Craft Table Saw.

WELDERS—1—Rex Heavy Duty Spot Welder 10 KVA. 2—Sciaky Spotwelders 50 KVA. 2—Taylor Spot Welders 27 KVA. 1—Progressive Spot Welder 50 KVA. 1—P6H Arc Welder. 1—Hi-Speed Heavy Duty Spot Welder. 3—Hobart Portable Arc Welders 200 Amp. 1—G.E. Portable Arc Welder 300 Amp. 1—Missing Link Portable Arc Welder 250 Amp.

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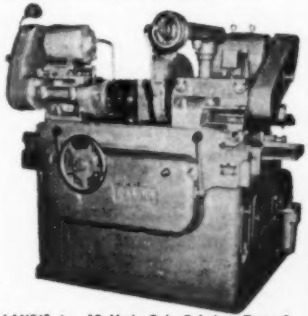
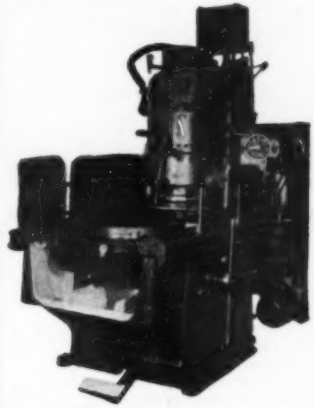
BORING MILL, 36"x44" Niles Vert., M.D. Side Head
BORING MILL, 48" Bullard M.D., 2 Heads
BORING MILL, 60" Betts Vert. 2 heads
BORING MILL, 16' Cincl.-Vert., M.D. 2 heads.
BORING MILL, 2½" Lucas Horiz., M.D.
BORING MILL, Lucas Horiz., 3" Bar, M.D.
BORING MILL, Giddings & L. #32 Horiz. 3½" Bar.
BARRELS, Tumbling Lapomatic, Schutte & Koerting.
BROACH, #3 LaPointe Horiz. 50" Stv. M.D.
COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 50 HP., M.D., 10x10, 278 CFM.
COM., Ing.-Rand ER-1, 100 HP Syn. M.D.
CRANE, DET Ricker 2 tons 11'9" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.
CHIP WRINGER, Barrett #251, M.D., 18" dia.
CHIP WRINGER, 20" Tolhurst M.D., Late.
RADIAL DRILL, 3'x9" Cincinnati-Bickford, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 10" Walker Turner M.D., Late.
DRILL, Fondich 10", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, 11/2I Baker Auto., S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2, M.D.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 10"
DRILL, 4 & 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, 4 Sp. Barnes H.D., M.D. #4 M.T., P.F.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Natco Multiple Spdle #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 19½" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40° below zero.
DEMAGNETIZER, SB-511 Magnaflux, late type.
FACING HEADS, 20" & 24" Monmart-Dixon.
FILER, #11-S Cockrane Bly Auto Saw Filer.
FILER, #11-S Type P4, Floor Type, M.D. Thiel
FURNACE, Miscellaneous Elec. 18 KW, 2100° F. cap.
FURNACE, Machler Steam Oven, Serial #3543.
GRINDER, #1 Wilmarth Norman Hand Surface, 6"x 12"
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #200, 18" Dble. End
GRINDER, Heald Rotary #25, M.D., 16" Cap.
GRINDER, Cylindrical, Norton, 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60"
GRINDER, Cylindrical, Cinci. 6x18 Filmatic, Late.
GRINDER, Thread, Jones & Lamson #TG-815, Late.
GRINDER, Heald #72A-1 Internal Size-Matic.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, #16 Blanchard Vert. Rotary Surface M.D.
GRINDER, Oliver Auto. M.D. Drillpointer
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #72 Heald Horiz. Rotary Surface, M.D.
GRINDER, Knapp #24, 24"x6", H.P. 7½"x6".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal
GRINDER, Landis 8"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1 Tool, 24" wheel
GRINDER, 97" Wheel Dia. Osterhaln Disc. 24" cap.
PROFILE GRINDER, Studer Type P8M, M.D., late.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #14 Spur, 18" dia. M.D.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.



LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

HAMMER, Rochester Nipseed, all sizes M.D.
HAMMER, Bradley 2000 Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
INDUCTION HEATER, 15 KVA, Ecco Hi Frequency.
INDUCTION HEATER, 20 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HOIST, 5 ton capacity Shepard Electric.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

DISC GRINDER
Osterhaln 17" Wheel Diameter Disc Grinder, 40 HP. TEFC 3/60/440 spindle motor drive. 24" capacity.



#16 BLANCHARD Vertical Rotary Surface Grinder, 25 H.P. Spindle Motor.

LATHE, Lo-Swing 8"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, 12"x18" Lips Carbo, Late Type, M.D.
LATHE, Hendey 12"x3" Q.C.G. Taper Attach. M.D.
LATHE, LeBlond 14"x8', Q.C.G. M.D.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, Lodge & Shipley 16"x6', Q.C.G., Grd. Hd.
LATHE, American 16"x6' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 16"x7' Q.C.G., M.D.
LATHE, American 18"x19' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Hendey 20"x10' Q.C.G., Tapper Att. M.D.
LATHE, Rood-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, Putnam 24/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, McCabe 26-48"x18' Double Spindle Lathe.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, Bullng Dble. End #VMTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1¼".
LATHE, Turret, #5 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cincl. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LIFT TRUCKS, Baker 1 & 2 ton, Platform & Fork
MILL, #4 Burke Motor Driven, Late, M.D.
MILL, 30 H. Sundstrand Horiz. Hyd. 2 Sp. M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #16 Garvin Plain Horiz., M.D.
MILL, #8Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinc. Horiz. #3, #4, #5 High Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.

No. 700 ESPEN LUCAS Hydraulic Heavy Duty Cut-off Saw, new 1945.

MILL, #0-S Cinc. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-S, Auto. Prod.
MILL, #0 Versen Hand Mill, M.D. Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILL, #1A Milw. Pl. Horiz., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert., M.D. Brown & Sharpe.
MILL, #4 Cinci. Vertical Ml Power, M.D.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 KW.
NIBBLER, Grey Turret Type ¼"x24" cap. M.D.
OZALID Model "F" Whitepriet Machine, Late.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 2½x11 Hanson-Whitney, Univ.
THREAD MILL 8x14 Pratt & Whitney No. 1100.
THREAD MILLER, Lees-Bradner #40A Automatic.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.
PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #2A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x20" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, 135 ton Clearing Single Crank 8" Str., Late.
PRESS, 70M Drake Hydraulic Arbor, New.
PRESS, #75½ Bliss S.S. 9½ Str. M.D.
PRESS, Robinson #3 O.B.I. 83 tons, M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Toledo 55½ S.S. 440 ton cap. 8" str.
PRESS, Waterbury-Farrell High Speed 90 tons #3W.
PRESS, 90C Bliss Double Action, 3 crank.
WHEEL PRESS, Chambersburg 400 tons cap. Hyd.
PRESS, Lucas 15 ton Power Arbor M.D.
PRESS, #60 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x¾", M.D.
PUNCH, R-41-P Wiedemann Turret, 14 stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH, H & J #5 Sgle end, 48" Thr. 2" thru 1½".
RIVET SETTER, ⅝" cap. Pneu. Tubular Rivet.
ROLLS, Bertsch Pyramid 18'x1½" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROUTER, #W240D, Onsrud, Electric M.D.
COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #6 Marvel Band 18"x18" cap., M.D.
SAW, #302 Campbell Abrasive Cut-off, M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap, M.D.
SAW, Band, Tannewitz & GH-36" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci. S.G., Motor driven, M.D.
SHAPER, Morton 36" Draw-Cut, 4-Speed, M.D.
SHEAR, #26 Buffalo Forge Slitting Armor Plate, 1¼" Round Cap.
SHEAR, Quickwork #-1 Rotary 60° Throat, 18 ga.
SHEAR, #8E Niagara M.D. 8'x3/16" cap. M.D.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 50 tons, 2½ cap. M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 CAM Haskins, Motor Driven, Late.
TAPPER, #1 Bahnsell (Warner & Swasey) Late.
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WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Seat.
WIRE STITCHER, Morrison and Acme, M.D.

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1¼" 8 Spindle Conomatic
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5/16" No. 00G Brown & Sharpe
8" 6-spindle Bullard mult-au-matic, Type A
8" 6-spindle Baird Timken bearing chucker, front and rear slides, late type

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4" Detrick & Harvey horizontal, floor type.
72" Niles Bement Pond, older style
American Fdy. & Mach. Co. vertical precision

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2-ton American Model HD horizontal hydraulic
No. 3XA Oilgear horizontal hydraulic
No. 1 Foote Burt duplex vertical surface
No. V 42 American hydraulic, 18 ton capacity
No. VU 12 LaPointe vertical hydraulic internal

DRILLS

20" Colburn No. 2 Heavy duty
11-Spindle No. 1 Baush multiple
22-Spindle No. 14 Natco multiple
30-Spindle No. 2 Baush multiple
34-Spindle No. A16 Natco multiple
No. 27 Fox vertical hydraulic multiple

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12" No. 12 Barber Colman hobbers
12" No. 12H G & E universal hobbers
16" Cincinnati hobbers
24" No. 3 Adams Farwell hobber
60" No. 5 Brown & Sharpe cutter
72" Schuchardt & Sihutte universal hobber
72" Westinghouse universal hobber
Nos. 1 & 5A Lees Bradner hobbers
No. 130 Cleveland "Rigidhobber"
4" Gleason spiral bevel generator

GRINDERS

No. 2 Cincinnati centerless
6"x30" Cincinnati Filmatic cylindrical
10"x18" Norton type C
23", No. 228 Hanchett opposed disc
30", No. 84A Gardner opposed disc.
Nos. 5, 16-28 & 24-36 Bryant internal
No. 72 Heald Gagematic & Sizematic
12"-16" No. 22 Heald rotary surface
6"x18" Doall hydraulic surface
No. 2 Brown & Sharpe universal

MONEY BACK GUARANTEE

MILLERS

No. 2 Cincinnati plain, motorized
No. 3 LeBlond plain, motorized
No. 3B Kearney & Trecker, SPD
12" & 18" Cincinnati Manufacturing
24" Cincinnati automatic duplex
4-36 Cincinnati hydromatic bed type
30", 42", & 84" rotary continuous (Newton & Ingersoll)
No. 31 Devlieg supermil
4" No. M80 Taylor & Fenn spline
8"x16" Hanson Whitney thread
No. CT 36 Lees Bradner thread

PLANERS, SHAPERS & SLOTTERS

30"x30"x10' Cincinnati, box table
36"x36"x8' American, double housing
36"x36"x8' Cleveland OS, one rail, one side head
36"x36"x10' Niles, AC motor drive
26" Smith & Mills back geared shaper, motorized
26" Worcester heavy duty shaper
26" Morton draw cut shaper
32" Ohio "dreadnaught," motor drive shaper
36" Niles traveling head shaper
10" Betts slotter
12" & 16" Bement slotter
24" Niles Bement Pond slotter

WRITE FOR LATEST CATALOG

MILES MACHINERY COMPANY

2025 E. GENESEE AVE. • SAGINAW, MICHIGAN

Phone Saginaw 2-3105

BORING MILLS

No. 0 G&L Horiz. Boring, Drilling and Mill. Mach.
No. 32 LUCAS Horizontal Boring, Drilling and Milling Machine
36" BULLARD Vertical Turret Lathe
100" BETTS Vertical Boring Mill

DRILLS

32" CINCINNATI BICKFORD Upright Drill
No. E5 NATCO Mult. Spindle Drill—Hyd. table, '42
No. 42S BAKER B.S. Heavy Duty Drill
No. 2MB LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT

No. 64 FELLOWS Gear Shaper
No. 72 FELLOWS High Speed Gear Shaper
No. 72SA FELLOWS High Speed Gear Shaper
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Roughor

GRINDERS

No. 5 B&S 3"x12" Plain Grinder
No. 4M LANDIS 4"x12" Plain Grinder
6"x18" CINCINNATI Plain Hyd. Cyl.—Filmatic
6"x18" LANDIS Type C Plain Grinder
8"x18" CINCINNATI Pl. Saddle Type Grinder
6"x18" NORTON Vertical Spindle Surface Grinder
10"x24" LANDIS Universal Grinder
10"x22" LANDIS Type C Hyd. Pl. Grinder—'42
No. 104 RIVETT Internal-External Grinder
No. 73 HEALD Internal Centerless Grinders
TG-185 J&L Internal Thread Grinder
No. 172 HEALD Internal Grinder

LATHES

12"x30" MONARCH Model C Toolmaker's Lathes
12"x54" MONARCH Toolmaker's Lathe
13"x18" MONARCH "Air Gage Tracer" MonaMatic
14"x6' HENDEY Model ECM M.D. Engine Lathe
14"x54" REED PRENTICE Geared Hd. Eng. Lathe
16"x30" LODGE & SHIPLEY Toolroom Lathe, '41
20"x10' LODGE & SHIPLEY Selective Geared Head
30"x16' bed AMERICAN "High Duty" Grd. Hd.
42"x15' AMERICAN Geared Head Lathe

MILLERS

No. 0-B CINCINNATI Plain Milling Machines
No. 0-B CINCINNATI Mod. OT) Vert. Mill. Mach.
No. 1-B KENT OWENS M.D. Production Miller
No. 1-12 KENT OWENS M.D. Prod. Millers
Model MMU U.S. Multi-Miller
No. 2 B&S Pl. Light Type Miller
No. 2M CINCINNATI Vertical Millers, 1941
18" CINCINNATI Mfg. Knee Type Milling Mach.
40"x16" P&W Model C Thread Miller
36"x36"x12" INGERSOLL Planer Type, 3 heads

AUTO LATHES & TURRETS

No. 2 B&S Wire Feed Hand Screw Machine
No. 2 W&S Geared Friction Hd. Turret Lathe
No. 3 B&O Ram Type Universal Turret Lathe
No. 3 J&L Ram Type Universal Turret Lathe
No. 1H3 LIBBY Heavy Duty Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1930
Nos. 4D & 6B P&J Auto. Lathes

WIGGLESWORTH INDUSTRIAL CORP.

203 BENT ST., CAMBRIDGE 41, MASS.-KIRKLAND 7-5242

McDONALD

USED MACHINERY

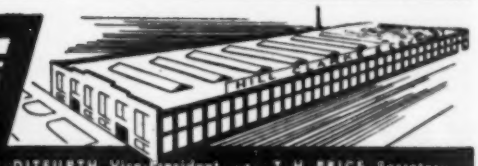
Landis 20"x72" and 18"x96" Plain Ext. Grinders.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x18" table.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table
Heald No. 72A-3 Hydr. Int. Grinder Rod Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.G. Lathe 13" hollow spindle.
Norton 6x18" Horiz. Hand Surf. Grinder 1941.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
20" All Grd. Camel Back Drill 1-Sp. and Barnes.
Amer. 3' & Morris 31-2 Arm Radial Drills.
Blanchard M.D. Vert. Sp. Surf Grinder 26" chuck.
Campbell No. 213 abrasive cut off 1947.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Ret. Surf. Grinder 12" chuck 1947.
Nazel #1-B Vert. Air Hammer A.C. M.D.
Landis 2-Sp. 2" Cap. Belt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Heald #70-A Rod Head Sp. Internal Grinder.
Springfield Planer Type Surf. Grinder.
P & J #2-M Auto. Prod. Miller, 2 Tables.
Foote-Burt #25 Box. Col. 1-Sp. Hvy. Drill.
J. & N. 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 26" stroke openside Shaper Planer.

MONA MEMBER

McDONALD MACHINERY CO.

1531-35 No. B'way., St. Louis 6, Mo.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

AUTOMATICS

¾" G Model Gridley
1-1/16" Model A Cleveland (1942)
1½" Foote Burt (1941)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1—Spdl—24" Sw—No. 2 MA6 Avey
2 Spdl—24" Sw—No. 2 Aveymatic
2 Spdl—24" Sw—No. 3 Avey
D-31 Fox Multiple Drill, No. 2 Taper.
6' Western Radial

GEAR MACHINES

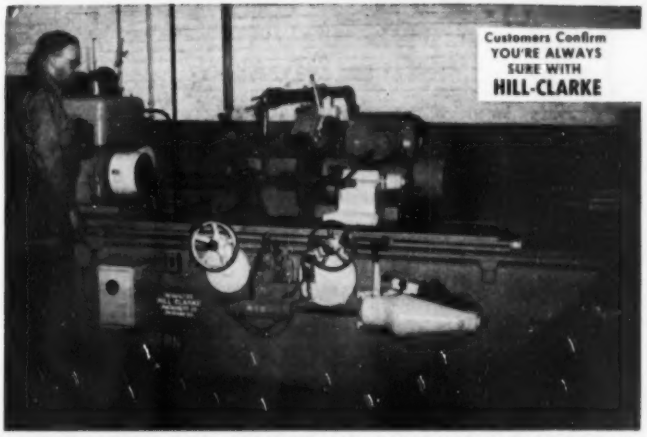
No. 12-H Gould & Eberhardt Hobber
No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.

BORING MACHINES

72" Niles—Hvy. Pattern

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers



OUTSTANDING PERFORMER in GREYHOUND CORP. RECLAMATION & REPAIR SHOP, Chicago, is this Hill-Clarke ReManufactured Norton Grinder. It occupies a key post in overhaul line in grinding crank shafts and other unit assemblies. Other Bus and Truck Companies can avail themselves of Greyhound's huge overhaul and repair service.

18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
5A Bryant Internal
5B Bryant Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 71 Heald Centerless Internal
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless
No. 44 Excello Carbide Tool Gdr.

LATHES

19"x8' LeBlond Hvy. Duty Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Libby Turret (1942)
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 4A Warner & Swasey—7½" Hole —Spdl.

MILLING MACHINES

6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

PLANERS

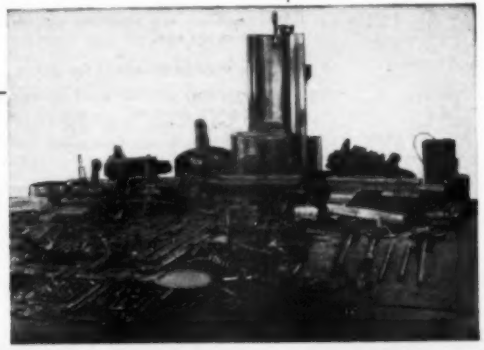
36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.
48"x48"x12' Gray Maxi-Service
48"x60"x27' American, 4 hds.

MISCELLANEOUS

2—12"x96" Magnetic Chucks
20'x1" cap Southwark Roll
14'x¾" cap Niles-B-Pond Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper
No. 200 Micro. Horiz. Hone, 1 Spdl.

Consult Us About Rebuilding Your Own Machinery

This is a Bullard Vert Turret Lathe in process of being rebuilt. We rebuild customer-owned machine tools.



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1. Hill-Clarke always give you an unconditional money-back guarantee.
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3. You can see your machine tested under power in our plant before purchasing.
4. Complete, modern facilities plus experience craftsmen for RE-MANUFACTURING machine tools in our 58,000 sq. ft. plant.
5. A responsible organization —with 85 years experience.

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- BROACHES
- DRILLS
- GRINDERS
- LATHES
- MILLS
- PLANERS
- PRESSES
- SHAPERS
- MISCELLANEOUS

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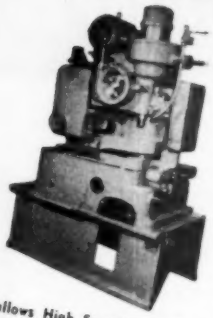

Type 27 Fellows High Speed Gear Shaper suitable for both spur and helical internal and external gears.

Reconditioned, fully guaranteed.

Available for immediate delivery.

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THE FOCAL POINT FOR PRODUCTION MACHINERY

LATE MODEL MACHINE TOOLS . .

AUTOMATIC SCREW MACHINES
No. RA-6 8/16" Acme Gridley, 1942
No. RA-6 1¾" Acme Gridley, 1943
2" Model A Cleveland, 1942
1 1/16" Model "A" Cleveland, 1943

DRILLS, RADIAL
3'9" Cincinnati Bickford, 1942
3 1/2" Archdale Radial (English), 1947

GEAR EQUIPMENT
No. 7 Gleason "New s Roughing, 1943
No. 6 Gleason Revacycle Generator, 1940
No. 72 Fellows M.S. Gear Shaper, 1942
10" Pratt & Whitney Hyd. Gear Grinder, 1942
Red Ring Universal Gear Checker, 1942
20M Fellows Red Liner Gear Tester, 1942

GRINDERS, CYLINDRICAL
16"x72" Norton Plain Type "C", 1941
16"x20x36" Norton Plain Type "C", 1942
14"x108" Norton Plain Type "C", 1942
12"x66" Fitchburg Plain Hyd., 1942
10"x18" Landis Plain Type "C", 1940

GRINDERS, INTERNAL
No. 72A1 Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943
No. 16 CP 16 Bryant Hydraulic, 1942
No. 16-16 Bryant Hydraulic, 1942
No. 172 Heald Hydraulic, Gap, 1940

GRINDERS, RADIUS
No. 73 Van Norman Radius Grinder, 1942

GRINDERS, SURFACE
No. 22 Heald Rotary 22" chuck, 1944

GRINDERS, THREAD
No. 19A Excello Internal Thread Grinder, 1943
No. 31 Excello Precision Thread Grinder, 1942

GUN BARREL MACHINES
No. ½Bx50 Pratt & Whitney Rifler, 1942
No. ½Bx50 Pratt & Whitney Reamer, 1942
No. ½Bx30 Pratt & Whitney Reamer, 1942

LATHES, ENGINES
58"x296" American Geared Head, M.D.
27"x192" Niles "Timesaver" Lathe, 1941
27"x90" Niles "Timesaver" Lathe, 1940
26"x180" Betts Bridgeford Lathe, 1940
26"x96" Betts Bridgeford Lathe, 1940
25"x120" Ledge & Shipley Gap Lathe, 1940
25"x120" Oldfield Schofield, New
14"x30" Bradford, 1942

LATHES, PRODUCTION
No. 3FU Foster Fastermatic Platen Type, 1942
No. 5SE Potter & Johnston Automatic, 1943
No. 4D Potter & Johnston Automatic, 1942
8"x84" Lo-Swing Semi-Auto, 1941
Lipe-Carbo-Matic Lathe, 1942

LATHES, TURRET
No. 1L Gisholt Universal Saddle Type, 1942
No. 3R Gisholt Universal Saddle Type, 1943
No. 4R Gisholt Universal Saddle Type, 1943
No. H5 Libby Universal Saddle Type, 1939
No. 5W Acme Universal Way Type, 1942
No. 5 Gisholt Universal Ram Type, 1942
No. 3 Gisholt Universal Ram Type, 1942
No. 4R Libby Universal Ram Type, 1942
No. 6R Denver Universal Ram Type, 1942
No. 3R Libby Universal Ram Type, 1942

MILLS, TOOL ROOM
No. 3 Van Norman Plain, 1942
No. 2 Cincinnati Vertical, 1942
No. 2K Milwaukee Plain, 1941
No. 4B Milwaukee Plain, M.D.
No. 3 Cincinnati Vertical, M.D.
No. 2G Kempsmith Universal, 1947
ALS Alcera Plain Mill (No. 2 Size), New
No. 2 Rapid Universal Mill, New
FPN 2B Mathey Vertical Mill, New

MISCELLANEOUS
2000 HP Midwest Dynamometer, 1942
75 HP Gardner Denver Air Compressor, 1945

PLANERS AND SHAPERS
52"x36"x40" Cincinnati Planer,
18" Ariston Shaper, New
24" Invicta Shaper, New
21" Ariston Shaper, New
18" Invicta Shaper, New

PRESSES
650 Ton Verson Double Action Eccentric, 1940

Partial Listing — Write for latest stock list

INDIANAPOLIS Machinery & Supply Co.

1961 S. Meridian St. . . Indianapolis, Indiana

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

CINCINNATI 60"x48"x14' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #25—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL. B & S #11, 7"x 32" Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

WE HAVE A LARGE STOCK FROM WHICH TO SELECT. TELL US WHAT YOU WANT.

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1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck
THOMPSON: Surface Grinder, Hydraulic 24"x48" (New 1952)

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"

HONING MACHINES

BARNES: No. 306H Vertical 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ⅛" to 1" dia.

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: 2Fx40" dia., for flat work
NORTON: No. 26 Hyprolaps, for flat work & Cylindrical lapping.

LATHES—PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
Reinecker Relieving Lathe (new)
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LE BLOND: Regal, 15" swing x 42" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
PROGRESS: Geared head 16" to 30" swing (New)
TRIPLEX: 14" dia. x 40" centers Toolroom Lathes (new)
VDF New Engine Lathe 49" swing x 20' centers
VDF New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
HERBERT: #2, #4, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

PRESSES

Gen. FLEX: Screw Press, 3 ton

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

SHAPERS

HERCULES: 16" & 22" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former.
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

CUT-OFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
PRESS: Screw. Gen. Flex. 3 ton
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
GOGAN BRINELL Hardness Tester Model 16-J
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 16" & 22" (New)
GRINDER: WICKMAN Optical Profile Form Grinder (New)
WIRE FORMING MACHINES: 4-slides (new)

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MACHINE TOOL ENGINEERS SINCE 1919

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BROACHING MACHINES

75 H.P. LaPointe Hydraulic Broach, m.d.
Cincinnati Mill Broach, m.d., 10" spindles, new

RADIAL DRILLS

2½" Fosdick, gear box on base
3' American Sensitive, new
4—13" rad. dia. Cincinnati-Bickford Super-Service, m.d., late
8'—17" rad. dia. Droses, gear box, m.d.
Zeus Precision Universal Bench Type Radial, m.d., new

BALL BEARING DRILLS

No. 15 Buffalo, floor model, m.d.
No. 15D Buffalo, floor model, m.d.
No. 18 Canedy-Otto, bench model, m.d.
Allen Bench Type, m.d., ½ H.P., 12" overhang
Mason Bench Type Single Spindle, belt
Providence Engineering Co., Model E, s.p.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 6 Fosdick, 8" overhang, belted m.d., No. 2 Taper
1 spindle Allen, belt drive
2 spindle Allen, belted m.d., 6" overhang
2 spindle Avey, size No. 1 Type B, style VHP, m.d., 8" overhang
2 spindle No. 3 Avey, belted m.d., p.f.
3 LMS—3 spindle Leland & Gifford High Speed, late, m.d.
4 spindle No. 3 Avey, belted m.d., No. 3 Taper, 12" overhang
6 spindle Leland & Gifford No. 2 Taper, m.d. on each spindle
6 spindle No. 2B Edlund, m.d., No. 2 Taper
6 spindle No. 3 Avey, belted m.d.
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper

HORIZONTAL DRILLS

Natco 1 spindle Horizontal Hydraulic Hole Unit, m.d.
3 way Natco Horiz. Drill, consisting of 3 E13 Hole-units
No. 1½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 1½Bx50" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
No. 1½ Pratt & Whitney 2 spindle, m.d., older type
3 spindle Detroit Semi-Automatic, belt
Special Horiz. Drilling Machine, Cincinnati-Bickford Head mounted horiz. on base

MULTIPLE SPINDLE DRILLS

C12 Natco, m.d., 10x16" head
C15 Natco, m.d., 12x18" head
No. 3 Baush, m.d., 16x30" head, 15 spindles
No. 3 Baush, m.d., 20x40" head, 15 spindles
No. 16 Foote-Burt Fixed Center, m.d.
3 spindle 12" Rockford Gang, m.d.
5 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 28" Cincinnati-Bickford Upright, m.d., No. 4 Morse Taper
4 spindle Niles-Bement-Pond, m.d., 12' rail, No. 5 Taper

UPRIGHT DRILLS

20" Barnes All Geared, m.d., tapper
24" Aurora, belted m.d.
24" Cincinnati-Bickford, m.d.
28" Weigel, belt drive, tapper
36" Aurora, m.d., tapper
32" Aurora, belt drive
DE Colburn, m.d., H.D.
No. 3A4 Baker, m.d.
No. 315 Baker, Heavy Duty, s.p.d.
No. 513 Baker, m.d.
32" Superior Drill
#4 Defiance Machine Co. Drill, m.d.

GEAR SHAPERS

No. 12 Fellows Gear Shaving Machine, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 1B Fellows Gear Finishing Machine, m.d.
No. 6I Fellows, belted m.d.
No. 61A Fellows, m.d., latest type
No. 64B Fellows, m.d.
No. 615A Fellows, m.d., late type
No. 64A Fellows, m.d., latest
No. 645 Fellows, belt
No. 72 Fellows, m.d., latest
No. 75 Fellows, m.d.

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6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical
No. 2MS Lees-Bradner Spur & Helical, m.d.
No. 13LS Fellows Gear Lapper, m.d.
SG11 Grinding Machine, m.d., latest

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OHIO 16"x72" PRODUCTION MILLING MACHINE, built new 1942. 10 hp 3-60-220 440 motor, controls, coolant pump.

ABRASIVE #34 VERTICAL SPINDLE SURFACE built new 1942, 7½ hp 3-60-220 440 motor controls, coolant pump, 1 shot lubrication new O. S. Walker permanent magnetic chuck

PRATT & WHITNEY 6" VERTICAL SHAPER (slotter) model B, built new 1941 motors controls 3-60-220 440.

LE BLOND #12 AUTOMATIC PRODUCTION LATHE, serial 12ML171, 13½ swing x 20" center. Motor and controls 3-60-220 440.

GISHOLT #3D RADIAL TYPE simplimatic AUTOMATIC LATHE, serial 535-X-7. Built new 1938, 24", 3 jaw air roperated chuck, 16" air cylinder, hardened ways, front rear and back mechanically driven slides.

GEMCO 20" PLAIN HEAVY DUTY CRANK SHAPER, serial 5030, built 1942. 5 hp 3-60-220 440 motor and controls.

CINCINNATI 18" PLAIN PRODUCTION MILLING MACHINE, serial 1F-1P-1L-591. Built 1942. 12 spindle speeds from 29 to 600 R.P.M. Motor and controls 3-60-220 440.

DEFIANCE MODEL 200—26" HEAVY DUTY PRODUCTION DRILL serial 824-37, #5 M.T. 7½ hp 3-60-220 440 motor, controls, spindle speeds 129 to 771 R.P.M.

All of the above machines are in excellent condition and carry our 30 day guarantee. They are priced at the OPS CEILING or below ceiling.

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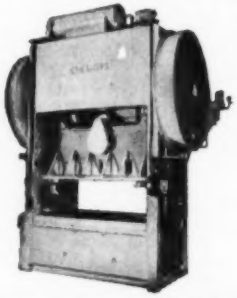

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H.P.M. 75-ton Riveting Press.
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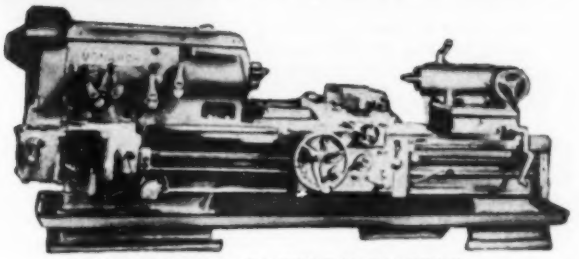
LAPPING MACHINES

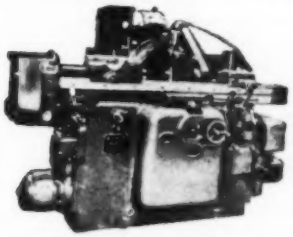
ULTRALAP Model 10 Vert. Lapper

LATHES

SOUTH BEND 10"x6' G.C.G. Engine Lathe 1" Cap.
MONARCH Model EE 19"x20" Toolroom
NEW LOGAN 11"x36" CC 1" Cap.
MONARCH Model N G.H. Engine Lathe 33½"x120" cc
LODGE & SHIPLEY G.H. Engine Lathe 24"-27"x16' cc
AMERICAN G.H. Engine Lathe 24"-27"x96" cc
AXELSON G.H. 24-Sp. Engine Lathe 16"x54" cc
LEHMANN G.H. 16-Sp. Engine Lathe 18"-20"x32" cc
AMERICAN G.H. Engine Lathe 16"-18½"x30" cc
MONARCH Model 5T Multi-Tool Mfg. Lathe 12"x16" cc
HARDINGE 2nd Operation Lathe 1" Cap.
CARROLL-JAMIESON 16"x8' G.H. 12-Speed Lathe



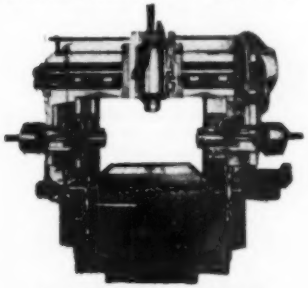
MONARCH 33½" x 120" ENGINE LATHE—MODEL N



JONES & LAMSON MODEL TG 12 x 45" AUTOMATIC THREAD GRINDER

TURRET LATHES

WARNER & SWASEY Mod. 2 G.H. Ram Type 1" Cap.
WARNER & SWASEY Mod 2 G.H. Ram Type 1½" Cap.
BARDONS & OLIVER Mod 2 G.H. Ram Type 1" Cap.
BARDONS & OLIVER Mod 3 G.H. Ram Type 1½" Cap.
WARNER & SWASEY Mod 3 G.H. Ram Type 1½ Cap.
GISHOLT Mod 3 G.H. Ram Type 1½" Cap.
LIBBY Mod 4R G.H. Ram Type 2" Cap.
BARDONS & OLIVER Mod 5 G.H. Ram Type 2" Cap.
WARNER & SWASEY Mod 5 G.H. Ram Type 2½" Cap.
GISHOLT Mod 5 G.H. Ram Type 2½" Cap.
FOSTER Mod 1B Univ. G.H. Saddle Type 2-9 1/16" Cap.



P&W 40" VERTICAL MILLER AND PROFILER—WITH TWO SIDE HEADS

AUTOMATICS

BROWN & SHARPE Model 00G ⅝" Cap.
CLEVELAND Model A Single Spindle 0-10" Cap.
CLEVELAND Model A Single Spindle 1-1/16" Cap.
CLEVELAND Model A 1¼" Cap.
CLEVELAND Model B Single Spindle 1½"—10" Cap.

BORE-MATICS

EXCELLO Model 2112A Single End Double Spindle Hyd. Cross Slide Table
HEALD Model 48A

DRILLS

NEW O. M. S. R. Type T.D. 2 Radial 4'x12" Column
NEW ZEWO Universal Floor Type Radial 21"x1½"
NEW CANEDY OTTO 18" Single Spindle ⅞" Cap.
NEW FAMCO 15" Bench Type Drill Presses ½" Cap.
NEW FAMCO 15" Floor Type Drill Presses ½" Cap.
MORRIS MOR-SPEED RADIAL 3'x9' Column
LELAND GIFFORD 2 Spindle

GEAR EQUIPMENT

BARBER-COLMAN Type S Gear Hobber
FELLOWS 3" Fine Pitch Shaper
GLEASON 12" Straight Bevel Generator—Finisher—Rougher
GLEASON 3" Straight Bevel Generator
GLEASON 3" Spiral Bevel Gear Generator
GLEASON 3" Bevel Gear Tester
GLEASON Model 6 Angular Hypoid Tester
GLEASON 10" Spiral Bevel Generator
BARBER-COLMAN Model 12 Hobber 12" Cap.
BARBER-COLMAN No. 3 Precision Hobber

GRINDERS

BROWN & SHARPE Model 2 Internal-External Universal Grinder 14"x30" Cap.
CINCINNATI Univ. Hydr. Cyl. Int.-Ext. Grinder 12"x 36" Cap.
NORTON Model C Hydr. Plain Cyl. Grinder 8"x30" Cap.
THOMPSON Model F Hydr. Surface Grinder 6"x18" Cap.
ROTOREX Model 181-A Universal T & C Grinder, w. Int. Att.
COVEL Model 91A Univ. T & C Grinder
JONES & LAMSON Model TG-12x45" Auto. Thread Grinder
EXCELLO Model 35 Thread Grinder
EXCELLO Model 31 Thread Grinder

MILLING MACHINES (Horizontal)

VAN NORMAN Model 36 Ram Type Duplex
VAN NORMAN Model 22L Ram Type Duplex
NEW CENTEC Model 2A Universal With Vert. Att.
BROWN & SHARPE Model 3B Heavy Plain
MILWAUKEE Mod 3B Plain
MILWAUKEE No. 1-B Universal Miller
SUNDSTRAND Rigidmill Bed Type Production
BROWN & SHARPE Mod 10 Auto. Production Miller
CINCINNATI Mod 00 Plain Horiz. Auto., Cycle

MILLING MACHINES (Thread)

PRATT & WHITNEY Model C-M-1004 Thread Miller 4½"x30"
HANSON & WHITNEY Univ. Semi-Auto. Thread Miller 10"x48"

MISCELLANEOUS

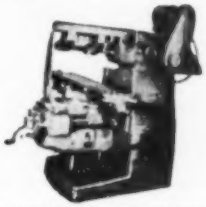
FAMCO 26, 8, 10, 12, 15 Foot Presses (NEW)
EXCELSIOR 26, 8, 10, 12, 15 Foot Presses (NEW)
ARBOR PRESSES (NEW)

VERTICAL MILLERS AND JIG BORERS

KNIGHT Model 3B Univ. Vert. Miller
MILWAUKEE Model 3 Vertical Miller
BROWN & SHARPE Model 2 Vertical Light Type Miller
BURTON Model 8D Super Speed Vertical Miller
CLEVELAND Model 1 Vertical Miller

PRESSES

WIEDEMANN Model R11P 18 Sta. Power Turret Punch
RUESCH #2 Percussion Press



NO. 36 VAN NORMAN MILLING MACHINES

PROFILERS

PRATT & WHITNEY 40-Inch Profiler 2 Side Heads
PRATT & WHITNEY 30" Single Spindle

SHAPERS

HENDEY Universal H.S. Crank Shaper 12"
GOULD & EBERHARDT Industrial Shaper 20"

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PEXTO 44" Geared Power Shear
NIAGARA Model 412 Power Shear 12'x16 Gauge

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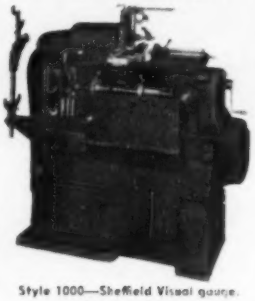
MACHINE TOOLS—1941—1951

4—#00G Brown & Sharpe Automatic Screw Machines, standard equipment, silent stock tubes, vertical slides, serial numbers 17041, 17042, 17074, and 16771—late.

4—#0G Brown & Sharpe Automatic Screw Machines, standard equipment, silent stock tubes, vertical slides, serial numbers 11837, 11855, 11818, 11709, and 11836—late.



Style 1000—Sheffield Visual gauge.

4—#00G Brown & Sharpe motor driven slotting attachments.

2—#0G Brown & Sharpe motor driven slotting attachments.

2—#2G Brown & Sharpe motor driven slotting attachments.

A variety of adjustable guides, box tools, burnishing tools, die heads, floating holders, fixed guides, gnurl holders, floating reamers and tap holders, recessing swing tool holders.

2—#1½ Grand Rapids Cutter and tool Grinders—late.

1—#10 Grand Rapids Cutter and Tool Grinder—1951.

1—Cincinnati #2 Centerless Grinder, with three extra regulating wheels and adaptors, three extra grinding wheels and adaptors, infeed and through feed rests with hand ejector—late.

1—Walker Turner 15" Floor Drills—late.

Clausing 12"x5' Engine Lathe GCG, with extra bed turret and hand lever cross slide—late.

South Bend Model A 9"x36" Lathe on bench, with chucks, milling attach. draw bar and collets—late.

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2 HP Ingersoll-Rand Air Compressor.

1—1 Ton and 1—1½ Ton Electric Budgit Hoists.

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Westinghouse Electric Hardening Furnace, pusher type, for 16" breech blocks. Range 0 degrees to 1800 degrees.

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(8) Potter and Johnson Automatic Chucking Machines

No. 6A, Model 2.
16" Chucks, 5 HP Motors.
Will swing 13" and will supplement your present turret lathes.
Recently overhauled and in good condition. May be inspected under power.

Will sell lot for best offer, including tooling, spare parts, extra cams, gears, etc., or will sell in pairs.

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NEW LATHES AT BARGAIN PRICES

New 18" x 80" Centers MEUSER LATHE and 24" x 120" Centers MEUSER LATHE. Complete with Taper Attachments, Chucks and all equipment. *GAP BED TYPE.* Available from stock all sizes up to 32" Swing. Will trade for other equipment.

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Clearing 500 ton double action Press, 18"x26" stroke, 61"x71" bed area.

Clearing 100 ton single action Press, 17" stroke, 36"x36" bed area.

American 4 ft. "Hole Wizard" Radial Drill, 11" column

2 Cincinnati #2 centerless Grinders, filmatic

Heald #48A single end Baromatic, 2 heads

Pratt & Whitney 4½x36 thread Miller

Sundstrand #1 vertical hydraulic production Miller

2 J & L #7D saddle type Turret Lathes

J & L #8D saddle type Turret Lathe

Barber Colman type A Hobbing Machine

Fellows #712 hi-speed Gear Shaper

Excello #724 Shell Turning Lathe

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LATE MODEL 36" x 36" x 12' INGERSOLL Adjustable Rail PLANER TYPE MILLER

One Rail Head—Two Side Heads. 40 HP AC Motor Drive.

In excellent condition. Can be inspected under power and is *available for immediate delivery.*

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Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 32, 3" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vert.
New 3" Hor. Bor. Mills

DRILLS AND RADIALS

American 6'x15" Univ.
Bausch Multi-spindle
Buffalo #2 Motor Spindle
Canedy-Otto 21" Sliding head New
Cincinnati Bickford 6'x15" col.
Natco #12 20 spindle drill, Bausch
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" cap.
Leland Gifford 2 LMS 3 MS

ENGRAVERS

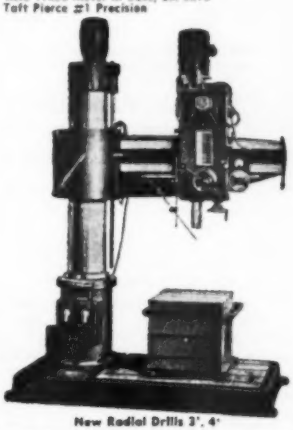
Deckel type 3 Dim., New
Gorton 3S Die Sinker
Gorton #1A, ME, Deckel GIL
Taylor-Hobson 3 dim.

GEAR EQUIPMENT

Barber-Colman #2, #12 (3), Flather 72" Cutter
Fellows High Speed Shapers 712, 725, 71
Fellows #20M Redliner
Flather 72" Cutter
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24-A
National Broach Red Ring Lapper
Schuchardt & Shutte #1 Hobber

GRINDERS, SURFACE

New 8x24" Hyd. Feed, 10x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Gallmeyer & Livingston #35, 8x24
G & L #35, 8"x24"
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hyd., 10x36" Hydr.
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base, 2A 6x18
Taft Pierce #1 Precision

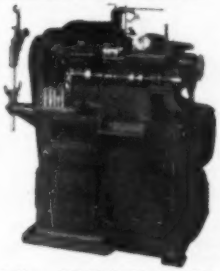


New Radial Drills 3', 4'

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shaper 7" Amco, 8" Shaperite — Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes Motors, Grinders, Buffers.

AUTOMATIC SCREW MACHINES



Brown & Sharpe (12) Model 0G, serial No's. 9600 & 10700 series, 5/8" capacity.
Brown & Sharpe (7) Model 00G, serial No's. 14, 15, 16000 series, 1/2" capacity.
Brown & Sharpe (4) Model 2G, serial No's. 8500 & 11500 series, 1 1/4" & 1 1/2" capacity.
Cleveland, Model AA-11, Serial #36586.
Cleveland, Model B, Serial #42618 843, 1-1 1/16" capacity.
Conomatic 4 Spindle, Serial 2309FF, 1 1/2" capacity.
New Britain Gridley 61 6 Spindle, Serial No. 25410, 1 5/8" capacity.

GRINDERS, MISCELLANEOUS

Brown & Sharpe #2 Universal
Bryant #5, Internal, chucking, 16A16
Cincinnati 6x18" Cyl. Hyd.
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ.
Majestic Internal, Grenby
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Sellers 6T Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Hendey 12"x42" and 12x30", 1941, 16x66"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed, 19x42"
Lipe-Carbo 12"x18" (2)
Late, P. & W. 16"x60
Lodge & Shipley #3A, #3 Duomatics
Sebastian 12"x4' G.H., Sheldon 12"
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15", 15" Stub
Rivett Model 918 Precision
New 16, 18, 20", 28" Immediate Del.

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14", Prod.
Brown & Sharpe #3B Plain, Late, 3A, 21, #2L
Cinc. No. 3, 4 Plain Spd.
Kent Owens 1V, 1-8 1-14, 1M
Kempsmith #1 Pl.,Vert. & Div. Hd
Milwaukee 2K, 2H Univ., 2H Plain
Milwaukee #2B, Plain & Univ.
Simmons Micro-Mill #1A
Sundstrand #00, 0, Rigidmills
Sundstrand #3A Rigidmill with copying Attach, 33
Van Norman #2L Univ.

MILLS, VERTICAL

Brand New Vertical Mills
Cincinnati #3, #4 hi-power, #4 Dial Type
Cincinnati 00 Vertical
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler T2B, 2 sp.
Reed Prentice 3V

PRESSES

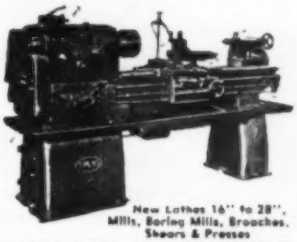
Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
Bliss 5-48 Dbl. 32x48" bed, Cushion
Toledo 92½c Dbl. Crank 41x23" bed
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herring, 15 Ton
Niagara A1¼, O.B.I.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LJ #3

TURRET LATHES

Acme 6W Fay 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed, Chuck
Gisholt Simplimatic
Jones & Lamson #5, Bar Feed
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, 3, #4 Proselector

MISCELLANEOUS

Band Saw: DoAll Zephyr 36", 16" Metalmaster
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Broach: 3L LaPointe Hydro. Horiz. New Klink. 6 Ton
Hacksaw: Peerless 6"x6"
Hones: Micromatic H-4
Keyseater Davis, Baker
Oil Groover: WICACO
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt, Cinn. 20, 24"
Shears Power: George Ohl 10' 3/16", 10' x 16 gauge, 11' 16 gauge
Welder: 50 KVA Taylor Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave



New Lathes 16" to 28", Mills, Boring Mills, Broaches, Shears & Presses

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

150 Ton Triple Action HPM Press
125 Ton Southwork Press, Bed 96"x30", 30" stroke, 2 to 4 ft. opening
8 and 9 oz. Injection Motors

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 20"x20" Platen 8" St. 19" opening

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NOLL DEPENDABLE REBUILT MACHINE TOOLS

AUTOMATICS

Acme-Gridley 6-Spindle Model R-6 1¼"
Cleveland S.S. 1-1/16" Model B (Latest)
Cone 4-Spindle 1½" Vertical Cut-Off (Latest)
Foote-Burt S.S. 1½" Vertical Cut-Off (with complete bar equipment and collets) (Latest)

BROACHES

American 6-Ton 26" Stroke Vert. Hydraulic
Colonial 1-Ton 12" Stroke Model VJ1-1-12
Oilgear 5-Ton 36" Stroke Horizontal

BORING MILLS

Bullard 36" Vertical, 1 Turret Swivel Head and 1 Ram Head
King 42" Vertical 2 Ram Heads (Swivel Type)
Niles 44" Vertical

DRILLS & RADIALS

Avey Single Spindle #2
Buffalo 3 Spindle #16 Sensitive Drill
Foote-Burt 6-Sp. #2 M.T. 8" Overhang (Latest)

GEAR EQUIPMENT

Barber-Coleman #3 Serrator Gear Hobber
Gleason 8" Straight Bevel Generator
Gleason 18" Combination Lapp'g & Test'g Machine

GRINDERS

Arter 8" Rotary Surface
Besly #26 Double Opposed
Cincinnati Valve Seat Gr's. (#1 Chucking Gr's.)
Gardner 18" Semi Automatic
Heald 12" Rotary #2 Surface (Late)
Heald #72A3 Sizematic Internal
Landis #4M Plain Hydraulic 4"x12" Type "H"
Landis 6"x20" Plain Hydraulic Type "A"
Landis 12"x28" Universal
Norton 10"x18" 45° Angular Grinder (Late)
Van Norman #673 Radius Grinder (Latest)
Wilson Maxi-Grinder Internal (1947)

LATHES

Acme Turret Flat Type Universal 3½" Hole in spindle 26" Swing
Gisholt Turret #3AL Saddle Type
Ostor Turret, Head Throw 11"—1½" No. 601
Boye & Emmes Engine Lathe 18"x72"
Prentice Engine 14"x36" Cone Head T.A.
Coulter 16"x30" Model "A" Threading Lathe
Fay 20"x55" Automatic (1945)
Seneca Falls 8"x18" Model "L-R" Lo-Swing
Sundstrand 8"x24" Stub Lathe

MILLS

Automatic 16"x20" Univ. Hob Thread Mill (Latest)
Brown & Sharpe #3A Universal Horizontal
Cincinnati 24" Duplex Table 35½"x8"
Cincinnati Duplex 45-48
DeVlieg #31 Production Mill Table 16"x66"—48" Travel
Ingersoll (28"x33" Table) Horiz. Slab Mill
Kent-Owens #1-B Hydraulic (1943)
Lees-Bradner 12"x24" Thread Mill Model HT (Latest)

PRESSES

Bliss 56-Ton Punch Press
Toledo 15-Ton #41 Horning & Wiring Press 1½" Stroke (Late)
Toledo 90-Ton #62C Double Crank Back Geared 2" Str.

PLANERS

Betts Double Housing 84"x60"x16' (Late)
Rockford 36"x36"x10' One Head on cross rail and one head on each side of table

SHAPERS

Pratt & Whitney 6" Vertical Maximum Stroke 6¼" (Latest)
Smith & Mills 25" Square Ram

MISCELLANEOUS

Westinghouse 22KW Lead Bath Furnace Type J 14" Dia. x 19¾" Depth (1942)
Fischer Groover #2 15" x 15" (Latest)
Nazel #3B 400# Pneumatic Forging Hammer
Manville Header 150-Ton with Magazine Loader 40-50 Strokes per minute
Micromatic Hone Horizontal has adjustable Head Capacity Dia. ¼ to 1"—Length ¼ to 6
Hill & Jones 1½" Bar Iron Shear 11" Throat
Ajax Upsetter 3" 45 Strokes per minute

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66"x30' NILES BEMENT POND Geared Head Engine Lathe, rapid traverse

28"x12' MONARCH Heavy Duty engine Lathe, taper attach., chucks, AC-MD

24"x72" centers Boye & Emmes heavy duty G.H. Engine Lathe, chuck, A.C., m.d.

No. 3L GISHOLT Turret Lathe, 5-3/16" hole in spindle, bar feed, chucks, tooling, new 1943

No. 2B FOSTER Geared Head Turret Lathe, rapid traverse, AC motors

54" Bullard Spiral Drive vertical Turret Lathe. Serial 23000. New 1943. Like New.

42" BULLARD Vertical Turret Lathe, New Era type, AC—MD

38" BULLARD Spiral Drive Vertical Turret Lathe, AC—MD, rebuilt

No. 3-24 Cincinnati Plain Hydromatic Mill

No. 1 DOUGLAS Plain Horizontal Mill, table 8"x32", power feeds, motor in base, Timken spindle, No. 40 taper, new 1942

#2 Van Norman Plain Mill. New 1942.

5'-13" column CARLTON Radial Drill, AC motor on arm, 13-1500 RPM, box table

4' AMERICAN High Speed Sensitive Radial Drill, 9" column, AC motor on arm

No. 6 TOLEDO O.B.I. Press, 56 Tons

25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

10"x24" Norton Surface Grinder. New 1943.

36" OHIO Dreadnaught Shaper, AC—MD

1½" LANDIS Bolt Threader, leadscrews, AC—MD

No. 22 Murchey Threader

75 Ton HENRY & WRIGHT Double Crank Dieing Machine, roll feed & scrap cutter

No. 135 Cleveland Rigidhobbers

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D & H 5" Floor Type Boring Mill.

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LODGE & SHIPLEY Patent Head Lathe 36" swing x 14' centers with 15 HP AC Motor Drive $4000.00

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NATCO, 10 Spindle Vertical Drilling Machine Model D-5 AC Motor $900.00

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2—Engine Lathe, 12"x40" centers, Gap.

1—Engine Lathe, 16"x60" centers, Taper attach. Gap.

1—Bench Radial Drill, Zewo, 21"x½" Cap.

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CINCINNATI 36" x 36" x 16' Planer, M.D.
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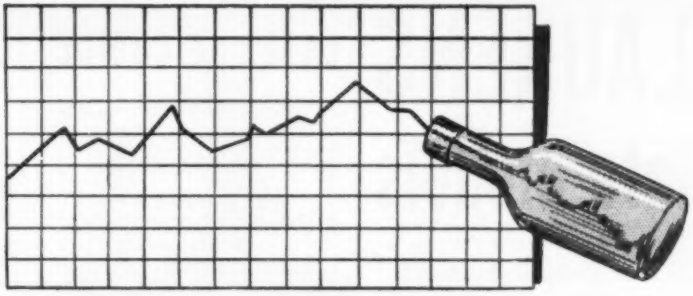

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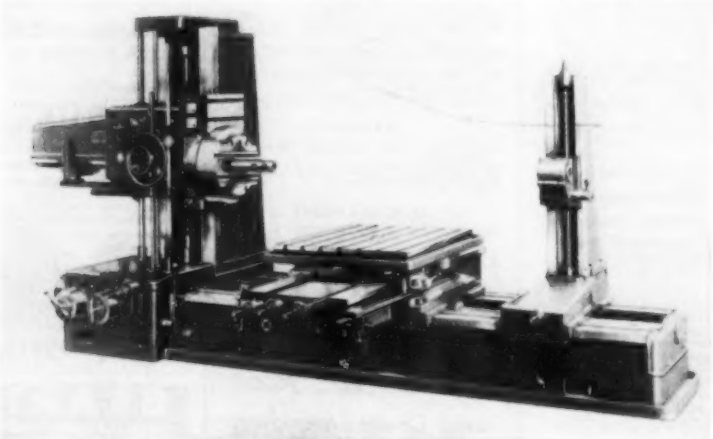

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Spindle diameter—3-9/16"
Spindle travel—39"
Maximum height of spindle to table top—39"
Number of speeds—18, (2.65 to 560 RPM)
No. of longitudinal & vertical feeds—40
Power rotary table—30" x 47¼"
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1—14" x 54" centers MONARCH Tool Room Lathe, geared head, new 1939-40, taper attachment
1—unused HEID 17" x 78" centers Heavy Duty Engine Lathe, new 1951.
1—30" x 14' bed AMERICAN TOOL WORKS Heavy Duty Engine Lathe, taper attachment
24—No. 8 SUNDSTRAND Automatic Lathes, new 1942-1944, 8" x 21" capacity.
7—No. 4 GISHOLT Second Operation Production Forming, Facing and Cut-off Lathes, new in 1947-48; with front and rear slides, hydraulic chucking, spindle hole 4½".
2—20" x 25' FAY Automatic Lathes, 1939-40.
1—Model U SENECA FALLS LO-SWING 14" x 24" Automatic Lathe, new in 1940.

TURRET LATHES

1—Model No. 4H-8 LIBBY Heavy Duty Saddle type Turret Lathe, new in 1940, 8⅛" hole thru spindle, 32" swing.
1—36" BULLARD spiral drive Vertical Turret Lathe, new 1940.
1—42" BULLARD spiral drive, vertical, 1940.
1—1 FU Foster "Fastermatic" automatic, 1942

AUTOMATICS

1—Model A 9/16" CLEVELAND Single Spindle Automatic, new in 1943.
1—Model A 1-1/16" CLEVELAND Single Spindle Automatic, new in 1940.
1—Model B 1¼" CLEVELAND Single Spindle Automatic, new 1943.
1—No. 60 NEW BRITAIN-GRIDLEY 1" Six-spindle Automatic Screw Machine, new 1941, with universal threading spindle, various tooling.

PLAIN & UNIVERSAL MILLING MACHINES

1—#2G KEMPSMITH Universal Mill, new 1947 with universal dividing head.
1—Model 3VG High Speed REED PRENTICE Vertical Mill and Die Sinker, new 1940.

CYLINDRICAL GRINDERS

1—10" x 18" NORTON type "C" Plain Grinder, 1942; with mechanical table traverse.
1—12" x 36" Type LC Norton Universal Grinder, new 1941.
1—14" x 48" CINCINNATI Self-contained Plain Grinder, 1940; with filmatic bearings.
14"x36" Type CD NORTON plain, 1941

INTERNAL GRINDERS

Several—No. 3B, No. 16 & No. 24 BRYANT Internal Grinders.
1—Model No. 72A-5 HEALD Precision Toolroom Internal Grinder, 1942, with cross sliding headstock.
2—No. 172 HEALD Hydraulic Internal Gap Grinders, new 1941-42, cross sliding and swivel workhead, swing in gap 4½".

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1—32" GOULD & EBERHARDT heavy duty Shaper.

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LATE and CHOICE

MILLS

No. 5 CINC. Pl. Horiz., Rect. Overarm Hi Power.
No. 22L VAN NOR Ram Type, Many Ex. '41
No. 0 VERNON Vert. and Horiz. (1942)
No. 2 SAIMP Univ., NEW, div. head
#4 Cinc. Pl. Horiz., 3 Step Cone M.D.

TURRET & ENGINE LATHES

No. 3A WARNER & S. Univ. Bar Fd. & Chuck
No. 3 B. O. Univ. Air Chuck & Collet (1940)
No. 2 B. & S. Wire Fd. Hand Screw Mach. '42
No. 2 DIEHL Tur., Air Chuck, P.F. to Tur. '42
16"x42" LEBLOND Rap. Production, Timk. '36
25" 28"x96" cc L. & S. Heavy Duty Engine
9" to 60" ENGINE LATHES. Older Type

GRINDERS

25A HEALD 24" Rotary Chuck. Like New '41
14"x36" P. & W. Vert. Surf., 12"x30" Chuck
10"x36" HILL CLARK Pl. Cylindrical (1943)
#2 CINC. Univ. Tool & Cutter 1937
No. 2 UNIV. Tool & Cutter, Many Att. (1940)
10" P. & W. Dble. Head Gear Grinder (1942)
No. 2 CINN. Centerless. Model B. & H.

DRILLS

S201 BARNES Box Column Hvy. Duty (1941)
No. 2 BUFFALO Box. Col., No. 3 M.T., P.F. Motor Spindle. (1943)
No. 2 ALLEN Mtr. Spdl., 1 on 3 Spdl. Base, '43
No. 1LMS LELAND GIFFORD High Spd. to 9000 rpm. New 1943
2 Spdle. AVEY No. 3 M.T. Tapping Att.

SAWS

9"x9" and 6"x6" PEERLESS Univ. Hack (After 1941)
36" YATES Hvy. Dty. Band, 10 h.p. Mtr. '43
New 6"x6" TOLEDO Hack

MISCELLANEOUS

Gear Shapers: (2) FELLOWS No. 6I 4 Spd. Mtr.
Automatic Chucker: 4 Spdl. CLEVELAND 8"
Vertical Shaper & Slotter: 6" P. & W.
Planer: 24"x24"x8' LIBERTY. Box Table

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Colonial Vertical Surface 10 ton 66"
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Colonial Vertical Pull Down 15 ton 48"
Colonial Horizontal Universal 10 ton 60"
American Vertical Pull Up 15 ton 42"

MISCELLANEOUS

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#3 Baird 4-Slide Forming Machine
Lester 6 oz. Injection Molding Machine

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BORING MILL: No. 32 Lucas Horiz., 3¼" Bar.
DRILL PRESS: H-3 Bornes Hydram. L.T.
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PLANER: 42"x39"x20' Cin.-4 Hds.; M.D.
GEAR SHAPER: No. 48 Fellows—72" Int. L.T.
SAW: No. 18 MARVEL. 18"x18". L.T.
GRINDERS: 60" Hanchett Face. L.T.
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GYROMATIC Model 40 15/8" 6 spindle. Late
CLEVELAND 3¼ Model A; Late Type.

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FRANKLIN 4½" Bar; table type; M.D.
LANDIS #40, 4" Bar, floor type; M.D.
LANDIS #35 floor type; 3½" bar; M.D.
LUCAS 41", table 24"x48"; M.D. Late.
NILES 8" bar floor type, motor drive.
UNIVERSAL 3" Bar, table 40"x58", M.D. Late

BORING MILLS—Vertical
BETTS 120" 2 heads P.R.T.; M.D.
BULLARD 8", 16" 6-spindle "A" Mult-au-matic
COLBURN 72", 2 heads PRT, M.D.
NILES 100", 2 swivel heads; motor drive.
NILES 53", 2 swivel heads, motor drive.
NILES 120" motor drive; late.

BRAKES & SHEARS
BESCO 14 gauge 60" Press Brake; NEW.
BESCO 14 gauge 72" Press Brake; NEW.
BESCO 36"", 20 gauge Power Sq. Shear; NEW.
BESCO 48", ⅛" gauge Power Sq. Shear; NEW.
BESCO 48", 16 gauge Power Sq. Shear; NEW.
BESCO 48", 14 gauge Power Sq. Shear; NEW.
BESCO 72", 14 gauge Power Sq. Shear; NEW.
BESCO 96"x¼" Power Sq. Shear; NEW.
BESCO 96"x¼" Power Sq. Shear; NEW.
CHAMBERSBURG 500 HF, Billet Breaker; late type.
JAMES RENNIE No. 8, Univ. Ironworker; late type.
NIAGARA No. 116 Squaring Shears; late type.
QUICKWORK No. 5 ½" rotary, M.D.
QUICKWORK No. 6, 1" capacity; motor drive.
WORMSER T-15; T-25; Univ. Ironworker; NEW.

BROACHES
CINCINNATI 1-32 Duplex Vert. Hydr.
COLONIAL, V.G. 1-10-48; Vert. Hydr. late.
OILGEAR 3XA Horizontal Int.; Late.

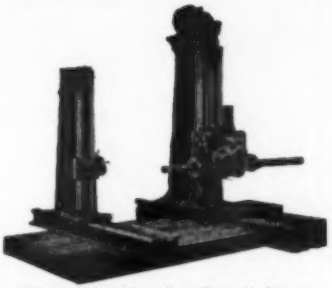
DRILLS—Radial
CINCINNATI BICKFORD 6'15" Univ.; M.D.
KITCHEN & WADE 3' arm 12" col. M.D.

DRILLS—Miscellaneous
AVEY No. 3, Ball bearing, Motor drive.
BAKER No. 217; Late.
BARNES No. 420 Deep Hole; late.
BARNES H-3 Hydram; hydr.; inverted; late.
BARNES H-2 Hydram; hydr.; M.D.
BARNES 26" 4-spindle Camel Back, Late.
BODINE #42-20 multi-univ., dial feed; M.D.
CINCINNATI 21", late.
FOOTE-BURT, 6-spindle, late type.
LeBLOND No. 2, deep hole, late type.
LEMAIRE, 5spindle, late type.
MOLINE 6-spindle Hole-Hog 3¼"; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6" & 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40, #45 Tooth Rounders; M.D.
DETROIT type GG-36 Gear Grinder; late type.
FELLOWS No. 4 Enveloping Gear Gen., M.D.
FELLOWS Nos. 61A, 62Z, 75, 7, 71, 7A, 72, 77 High Speed Gear Shapers; late.
FELLOWS 13-LS Lapper; late.
GLEASON #20 Tester Late Type.
GLEASON 25" straight dbl. gear gen.; M.D.
GLEASON #13 bevel cutter-grdr. M.D. late
GLEASON 18" bev. gear Tester & Lapper; M.D.
GLEASON #6 Revacycle. Late type.
GLEASON No. 12 Tool Sharpener; late.
GLEASON 12" Straight Bevel Gen.; late.
GLEASON #4 & #6 Tester, Late Type.
GLEASON 10", 11" & 18" Bevel Gear gen.
GLEASON 24", 37", 77", 96" Bev. Gear Planer
GLEASON No. 14 Hypoid Grinder; late.
MICHIGAN Gear Finisher, Model 862-24-A, 24" cap. Late Type.
MICHIGAN #884 Gear Shaver; Late.
PRATT & WHITNEY 10" Gear Grinder; late.

GEAR HOBBERS
BARBER COLMAN 12Z Motor Drive.
BARBER COLMAN Type A; Late.
GOULD & EBERHARDT #12H; Late.
GOULD & EBERHARDT #18H, Motor Drive.
GOULD & EBERHARDT #36 H; Late.
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late.
PFAUTER RS1; Max. dia. 30" late.

GRINDERS—Plain Cyl. & Univ.
BROWN & SHARPE #5 Pl. Cyl.; late.



LANDIS #40, 4" bar, Floor Type, Horizontal Boring, Milling and Drilling Machine.

CINCINNATI 14x72 Model EM Plain, Late.
LANDIS 16x36" Type C Plain, Hydr. Late type.
LANDIS 10x36" Type C Plain, Hydr. Late type.
LANDIS 10x18" Type C; late type.
LANDIS 30"x240" Plain cyl., M.D.
NORTON 10x72; type C; plain; M.D.
NORTON 10x120; plain; M.D.
NORTON 14x60" plain; late.

GRINDERS—Surface
ARTER 8" Rotary, M.D.
BILLITTER & KLUNZ 48"x196" Way Grinder.
BLANCHARD #16 Hi Power Vertical; Late.
HEALD #22 Rotary, 12" chuck; m.d. Late.
PRATT & WHITNEY 14x36" Model B, Late.
THOMPSON 2V Special; late type.

GRINDERS—Miscellaneous
BRYANT No. 3 Internal; hydraulic; late.
BRYANT No. 5 Internal; hydraulic; late.
BRYANT No. 16-C-16 Internal; hydraulic; late.
BRYANT No. 16-CP-16 Internal; hyd.; late.
BRYANT No. 24 Internal; hydraulic; late.
EXCELLO #48 Carbide Late.
HEALD 75A, special internal; late type.
HEALD #72AS Plain Internal; late.
HEALD No. 72A-5 "Gagematic" Int.; Late.
HEALD No. 72-A-3 "Gagematic" Int.; Late.
HEALD 72-A-3, 72-A-5 Plain; motor drive.
HEALD No. 78 Internal Centerless; M.D.
LEMPCO 22x72" Mod. KG Crankshaft; Late.
VAN NORMAN 666 Crankshaft Regrind.
VAN NORMAN 639 Osc. type Radius; Late.

HEADS AND UPSETTERS
ACME 2" Model XN, late type.
AJAX 3½" Upsetter, motor drive.
MANVILLE #3 DSOD, Motor Drive.
MANVILLE #2 DSOD, Motor Drive.
MANVILLE #1A DSSD, Motor Drive.
WATERBURY FARREL #11, DSSD, M.D.

LATHES—Engine & Mfg.
AMERICAN 8ex32" centers geared heavy.
DENHAM 16x48" centers, Gap; late type.
DENHAM 12x54" centers, Gap; late type.
DENHAM 16x72" centers, Gap; late type.
GRAHAM NORMANTON 12"x48" centers; late.
HENDEY 12"x54" centers, belted motor drive.
JONES & LAMSON "FAY" 20x25" Auto. Late.
LEHMANN 16"x36" Hydratrol; late type.
LEHMANN 25x96" center; Timken; grd. M.D.
LeBLOND 16x36" center; Auto.; Timken; late.
Leblond Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 14"x30" Centers, late type.
LODGE & SHIPLEY 16"x30" Centers, late type.
LODGE & SHIPLEY 24"x96" centers; Late.
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SPRINGFIELD 16"x30" Centers, Timken; late.
SPRINGFIELD 14"x42", geared; M.D.
SUNDSTRAND 10x60" Auto. Late Type.
SWIFT 16"x72" Centers; M.D. Late.
SWIFT 20"x120" Centers; late.

LATHES—Turret
MOREY No. 2 ram type TIMKEN.
GISHOLT 1L, Saddle type, M.D.
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KEMPSMITH #2 Timken; Univ. M.D.
CINCINNATI 4-48,4 spindle, Tracer; Late.
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STARR No. 2, table 12"x36"; late.
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GOULD & EBERHARDT 28 Cont. type; M.D.
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ESPEN LUCAS No. 670 30' cap, Hydr.; Late.
GROB OS-20 metal band saw & filer; Late.
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BESCO B-4, back flywheel; NEW.
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BLISS No. 3½A geared toggle; dble. acting.
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HANNIFIN 6-ton, 16-ton; hydr.; Late.
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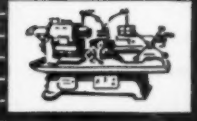

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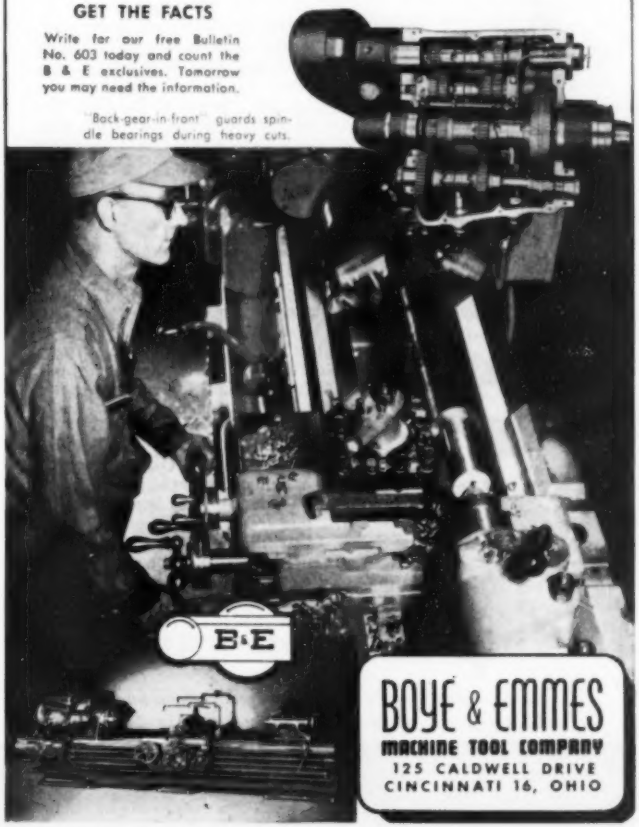

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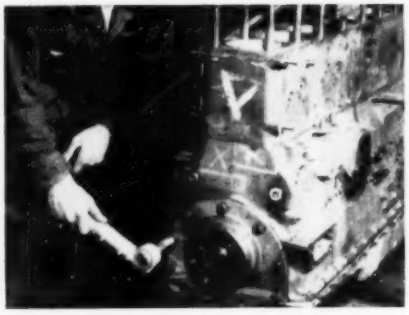

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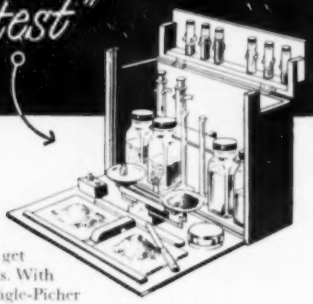

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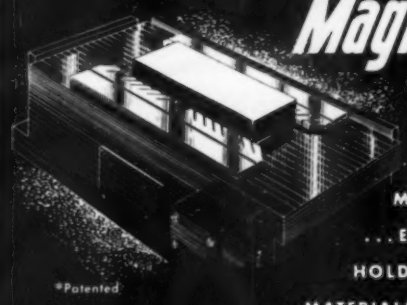

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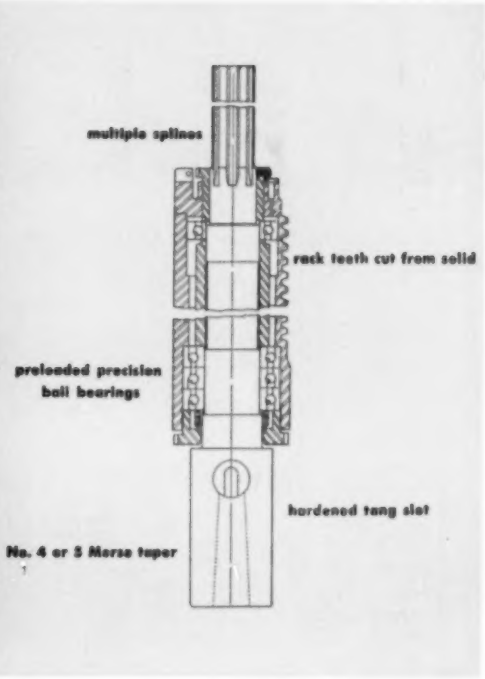

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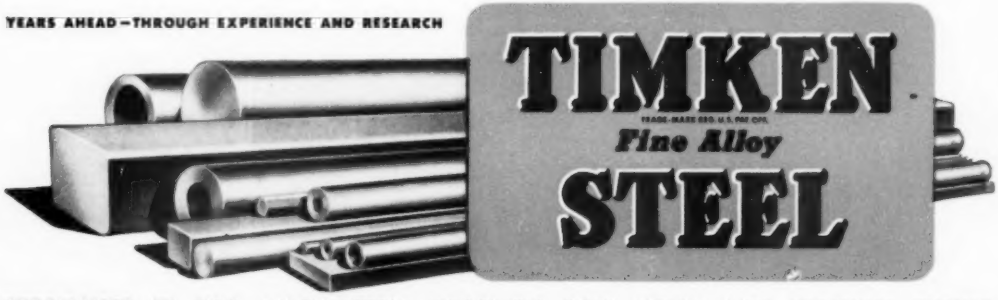

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